

Contributing to One World, One Health*

A Strategic Framework for Reducing Risks of Infectious Diseases at the Animal–Human–Ecosystems Interface

14 October 2008

Consultation Document

Produced by:



**World Health
Organization**



UN System
Influenza Coordination



THE WORLD BANK

Contents

Abbreviations and acronyms	3
Executive summary	5
1 Introduction: HPAI and beyond	8
2 Achievements and lessons learned from HPAI and their relevance to EID	9
2.1 <i>Current status</i>	9
2.2 <i>Achievements of the ongoing HPAI response</i>	10
2.3 <i>Lessons learned</i>	10
3 Emerging and existing infectious diseases and their impacts	16
4 The Strategic Framework	17
4.1 <i>Goal</i>	17
4.2 <i>Overall objective</i>	18
4.3 <i>OWOH perspective and its relevance to this Strategic Framework</i>	18
4.4 <i>Guiding principles</i>	19
4.5 <i>Prioritization</i>	19
4.5.1 <i>Identifying priority actions</i>	20
4.5.2 <i>Targeting specific diseases</i>	20
4.6 <i>Burden of disease, benefit–cost analysis and costing strategies</i>	21
4.7 <i>The public-private good dimension at different levels</i>	21
4.8 <i>Role of international agencies in addressing global public goods</i>	22
4.9 <i>Building on existing institutions and their unique strengths</i>	23
5 Specific objectives and outputs	23
5.1 <i>Objective 1: Develop surveillance capacity, including the development of standards, tools and monitoring processes at national, regional and global levels</i>	23
5.2 <i>Objective 2: Strengthen public and animal health capacity, including communication strategies to prevent, detect and respond to disease outbreaks at national, regional and international levels</i>	24
5.3 <i>Objective 3: Strengthen national emergency response capability, including a global rapid response support capacity</i>	26
5.4 <i>Objective 4: Promote inter-agency and cross-sectoral collaboration and partnerships</i>	26
5.5 <i>Objective 5: Control HPAI and other existing and potentially re-emerging infectious diseases</i>	28
5.6 <i>Objective 6: Conduct strategic research</i>	29
6 Cross-cutting issues to be addressed	30
6.1 <i>Surveillance and disease intelligence at the three health domains</i>	30
6.2 <i>The need to improve biosecurity</i>	30
6.3 <i>Bioterrorism</i>	31
6.4 <i>Mechanisms to address socio-economic disincentives</i>	31
6.5 <i>The need to address broader developmental issues</i>	31
6.6 <i>Communication strategies at different levels</i>	32
6.7 <i>Private-public partnership</i>	32
6.8 <i>Monitoring and evaluation</i>	33
7 Institutional issues	33
7.1 <i>Guiding principles and characteristics of a successful network</i>	34
At the country level	34
At the regional level	35
At the international level	35
7.2 <i>Institutional coordination and collaboration</i>	35

At the country level	35
At the international level	37
8 Financing the framework	38
8.1 <i>Shifting the paradigm: Broadening the avian and pandemic influenza response</i>	38
8.2 <i>Global public goods and international commitment</i>	39
8.2.1 Global and national public goods	39
8.2.2 Funding obligations and international commitment	40
8.3 <i>Responding to the AHI threat: An unfinished agenda</i>	41
8.3.1 A flexible, adaptable framework for fighting AHI	41
8.3.2 Achieving HPAI control	41
8.4 <i>Capacity building for prevention: A results-based approach</i>	
<i>Inter-epidemic and inter-pandemic periods</i>	43
An incremental approach to financing	43
8.4.1 Toward OWOH	43
8.4.2 Tailoring systems: Risk, budget and timeframe	44
8.4.3 Cost structure of the Framework	44
8.4.4 Some preliminary cost estimates	47
8.5 <i>Contingency funding for the unknown</i>	
<i>Epidemic and pandemic periods</i>	48
8.6 <i>Source of funds</i>	48
8.7 <i>Existing initiatives</i>	49
8.8 <i>Moving forward</i>	50
Annex 1: The Manhattan Principles on ‘One World, One Health’	51
Annex 2: Advantages and challenges to an OWOH approach	53
Annex 3: List of diseases of common interest	55
Annex 4: International technical agencies, collaboration and new mechanisms	56
Annex 5: Indicative research topics	61
Annex 6: Basic assumptions used to assess the Strategic Framework’s financing requirements	63
Annex 7: References	66
Annex 8: Web links	67

* The ‘One World, One Health’ concept, which establishes a more interdisciplinary and cross-sectoral approach to preventing epidemic or epizootic disease and for maintaining ecosystem integrity, is a trademark of the Wildlife Conservation Society.

Abbreviations and acronyms

AB-CRC	Australian Biosecurity Cooperative Research Centre for Emerging Infectious Disease
ADIS	Animal Disease Information System (EC)
AHI	Avian and human influenza
AIDS	Acquired immuno-deficiency syndrome
ALive	African Partnership for Livestock Development, Poverty Alleviation and Sustainable Growth
APEC	Asia-Pacific Economic Cooperation
ASEAN	Association of Southeast Asian Nations
ASEAN+3	Association of Southeast Asian Nations plus the People's Republic of China, Japan and the Republic of Korea
ASF	African swine fever
ARI	Advanced Research Institutions
AU-IBAR	African Union Inter-African Bureau for Animal Resources
BSE	bovine spongiform encephalopathy
CBPP	Contagious bovine pleuropneumonia
CDC	Centers for Disease Control and Prevention (USA)
CGIAR	Consultative Group on International Agriculture Research
CIDA	Canadian International Development Agency
CMC-AH	FAO/OIE Crisis Management Centre (Animal Health)
CSF	classical swine fever (also known as hog cholera)
ECTAD	Emergency Centre for Transboundary Animal Diseases (FAO)
ECO	Economic Cooperation Organization
EID	Emerging infectious diseases
EC	European Community
EU	European Union
EMPRES	Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (FAO)
ETPGAH	European Technology Platform for Global Animal Health
FAO	Food and Agriculture Organization of the United Nations
FMD	foot and mouth disease
GALVmed	Global Alliance for Livestock Veterinary Medicines
GF-TADs	Global Framework for Progressive Control of Transboundary Animal Diseases (FAO/OIE)
GIS	Geographic information system
GLEWS	Global Early Warning System (FAO/OIE/WHO)
GOARN	Global Outbreak Alert and Response Network (WHO)
GPAI	Global Program for Avian Influenza
HIV	Human immuno-deficiency virus
HPAI	Highly pathogenic avian influenza
H5N1	'Avian influenza A' subtype (H5 haemagglutinin; N1 neuraminidase)
IFAH	International Federation for Animal Health
IFIs	International financial institutions
INAP	Integrated National Action Program
INFOSAN	International Food Safety Authorities Network (WHO/FAO)
IHR	International Health Regulations
IUCN	International Union for Conservation of Nature
MDGs	Millennium Development Goals

MZCP	Mediterranean Zoonoses Control Programme (WHO)
NGO	Non-governmental organization
OFFLU	Network of Expertise on Avian Influenza (OIE/FAO)
OIE	World Organisation for Animal Health
OIRSA	Organismo Internacional Regional de Sanidad Agropecuaria
OWOH	One World, One Health
PAHO	Pan American Health Organization (Regional Office, WHO)
PPP	Public-private partnership
PPR	<i>Peste des petits ruminants</i>
PRC	People's Republic of China
PVS	OIE-PVS Tool for the Evaluation of Performances of Veterinary Services (formerly "Performance, Vision and Strategy")
RAHIS	Regional Animal Health Information System (OIE)
RIMSA	Inter-American Meetings, at Ministerial Level, on Health and Agriculture
RVF	Rift Valley fever
SAARC	South Asian Association for Regional Cooperation
SARS	Severe acute respiratory syndrome
SEARO	Southeast Asia Regional Office (WHO)
SSAFE	Safe Supply of Affordable Food Everywhere Initiative
TADs	Transboundary animal diseases
TADinfo	Transboundary Animal Disease Information System (FAO)
TB	Tuberculosis
UN	United Nations
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
UNSIC	United Nations System Influenza Coordinator
USA	United States of America
USAID	United States Agency for International Development
vCJD	variant Creutzfeldt-Jakob disease
WAHID	World Animal Health Information Database (OIE)
WAHIS	World Animal Health Information System (OIE)
WCS	Wildlife Conservation Society
WHO	World Health Organization
WHO/AFRO	World Health Organization - Regional Office for Africa
WNF	West Nile fever
WNV	West Nile virus
WHO/WPRO	Western Pacific Regional Office (WHO)
WTO	World Trade Organization
WWF	World Wildlife Fund

Executive summary

Humanity faces many challenges that require global solutions. One of these challenges is the spread of infectious diseases that emerge (or re-emerge) from the interfaces between animals and humans and the ecosystems in which they live. This is a result of several trends, including the exponential growth in human and livestock populations, rapid urbanization, rapidly changing farming systems, closer integration between livestock and wildlife, forest encroachment, changes in ecosystems and globalization of trade in animal and animal products.

The consequences of emerging infectious diseases (EID) can be catastrophic. For example, estimates show that H5N1 highly pathogenic avian influenza (HPAI) has already cost over US\$20 billion in economic losses. If it causes an influenza pandemic, it could cost the global economy around US\$2 trillion. Therefore, investments in preventive and control strategies are likely to be highly cost-effective.

Concerns about the potential for a pandemic have spurred worldwide efforts to control the H5N1 virus subtype. This virus spread out of the People's Republic of China in late 2003 into the rest of Asia, then Europe and Africa. The success of these control efforts is reflected in the fact that over 50 of the 63 countries affected by the virus have managed to eliminate it. But H5N1 HPAI remains entrenched in several countries, and it still has the potential to cause a pandemic.

Participants in the December 2007 New Delhi International Ministerial Conference on Avian and Pandemic Influenza recommended that the international community draw on experiences with HPAI and develop a medium-term strategy to address EID. It was agreed that a better understanding of the drivers and causes around the emergence and spread of infectious diseases is needed, under the broad perspective of the 'One World, One Health' (OWOH) principles (see Annex 1). The following Strategic Framework has been developed jointly by four specialized agencies—Food and Agriculture Organization (FAO), World Organisation for Animal Health (OIE), World Health Organization (WHO), United Nations Children's Fund (UNICEF)—and by the World Bank and the UN System Influenza Coordinator (UNSIC) in response to the New Delhi recommendation.

The Strategic Framework focuses on EID at the animal–human–ecosystems interface, where there is the potential for epidemics and pandemics that could result in wide-ranging impacts at the country, regional and international levels. The objectives and outputs of the Strategic Framework focus on some of the major drivers for emergence, spread and persistence of EID. The approach pursued in the Strategic Framework builds on lessons learned from the response to ongoing HPAI H5N1 infections.

The objective of the Framework is to establish how best to diminish the risk and minimize the global impact of epidemics and pandemics due to EID, by enhancing disease intelligence, surveillance and emergency response systems at national, regional and international levels, and by supporting them through strong and stable public and animal health services and effective national communication strategies. National authorities play a key role in devising, financing and implementing these interventions. Successful implementation will contribute significantly to the overall goal of improving public health, food safety and security, and the livelihoods of poor farming communities, as well as protecting the health of ecosystems.

There are five strategic elements to this work:

- Building robust and well-governed public and animal health systems compliant with the WHO International Health Regulations (IHR 2005) and OIE international standards, through the pursuit of long-term interventions
- Preventing regional and international crises by controlling disease outbreaks through improved national and international emergency response capabilities
- Better addressing the concerns of the poor by shifting the focus from developed to developing economies, from potential to actual disease problems, and through a focus on the drivers of a broader range of locally important diseases
- Promoting wide-ranging collaboration across sectors and disciplines
- Developing rational and targeted disease control programmes through the conduct of strategic research.

The overall objective of the Strategic Framework represents an international public good. Its achievement will involve the strengthening of existing animal and public health surveillance, response, prevention and preparedness systems at the country, regional and international levels.

Priority interventions and associated actions will be established by officials at the country level and will be prioritized with the help of experienced international agency personnel. They will be identified based on known areas of risk ('hotspots') for disease emergence and on research findings that point to new risks. The Strategic Framework does not propose prioritization of diseases to target: instead it brings benefits to poor communities and agricultural sectors by reducing the risks of infectious diseases that are important locally—e.g. Rift Valley fever (RVF), tuberculosis (TB), brucellosis, rabies, foot and mouth disease (FMD), African swine fever (ASF) and *Peste des petits ruminants* (PPR). This approach will not only control existing and often neglected infectious diseases, but will also promote surveillance for EID at a grassroots level by embedding global concerns within a local context.

Based on these considerations, the following six specific objectives have been identified as areas for possible priority emphasis by national authorities:

- Develop international, regional and national capacity in surveillance, making use of international standards, tools and monitoring processes
- Ensure adequate international, regional and national capacity in public and animal health—including communication strategies—to prevent, detect and respond to disease outbreaks
- Ensure functioning national emergency response capacity, as well as a global rapid response support capacity
- Promote inter-agency and cross-sectoral collaboration and partnership
- Control HPAI and other existing and potentially re-emerging infectious diseases
- Conduct strategic research.

Implementation of the Strategic Framework will be guided by key principles. These include the adoption of a multidisciplinary, multinational and multisectoral approach; the integration of technical, social, political, policy and regulatory issues; and the establishment of broad-based partnerships across sectors and along the research-to-delivery continuum. They will include engagement of wildlife and ecosystems interests, the human and veterinary medical community, and advanced research institutions (ARI).

National authorities will be encouraged to build on national strategies on EID, to engage with the private sector to strengthen local capacity and to promote long-term sustainability. This would include the strengthening of institutions already in existence, in addition to the structures, mechanisms and partnerships that have been developed in response to the HPAI crisis among international agencies (FAO, OIE, WHO and UNICEF) such as UNSIC, the Global Early Warning System (GLEWS), the Global Framework for Progressive Control of Transboundary Animal Diseases (GF-TADs), and the FAO/OIE Crisis Management Centre (CMC-AH), as well as those developed between the public and animal health sectors. This would be done without requiring the integration or fusion of their roles. The Strategic Framework will encourage the formation of flexible, formal and informal networks of partners, and will promote pro-poor actions and interventions.

In considering options for financing implementation, key issues to be addressed include the benefit–cost ratio of various options, long-term sustainability, public versus private goods and the political commitment of key stakeholders. Donor funding will be sought, including a combination of grants and loans.

This joint Strategic Framework will be presented as a consultation document at the International Ministerial Conference on Avian and Pandemic Influenza in Sharm el-Sheikh, Egypt, October 25–26, 2008. It will be discussed by high-level participants from countries, international technical agencies, regional organizations, ARI, donors and the private sector. This should provide an opportunity for the key stakeholders to discuss the Framework and consider how best to reach a consensus on sustained efforts to control EID. In due course, national authorities should consider the degree to which they are ready to make long-term political and financial commitments for validation, implementation and monitoring impact.

1 Introduction: HPAI and beyond

It is now nearly five years since highly pathogenic avian influenza (HPAI) caused by subtype Influenza A (H5N1) spilled over from the People's Republic of China to Southeast Asia and then to the rest of Asia, Africa and Europe. The rapid spread, huge economic losses, high case fatality ratio in human infections, and the threat of a human pandemic triggered a concerted global reaction to launch worldwide efforts to control the disease.

In December 2005, at one of the first of a series of international HPAI consultations held in Beijing¹, it was recognized that the world was unprepared for the rapid spread of a virus that was already causing devastation of the poultry industry worldwide. At this conference, over US\$1.8 billion were pledged to support a global emergency response to control HPAI; as well, there emerged an international consensus for the need to structure a coordinated global response focusing on three critical areas. These were to:

- a. Prevent a human influenza pandemic by controlling the highly pathogenic H5N1 virus in poultry and to prepare for a possible future pandemic by making substantial improvements in disease surveillance
- b. Contain a human influenza pandemic by rapid detection and care of human cases and by preventing sustained human-to-human transmission of the pathogen
- c. Ensure the continuity of essential services and systems and mitigate the potentially devastating impacts of the pandemic on public health, society, systems for governance and the global economy.

The conference also established four fundamental principles, now referred to as the Beijing Principles, to support a coordinated global health strategy. These principles were: a) to promote a multi-sectoral approach; b) to focus action on individual countries, which would develop and own their control strategies; c) to adopt a balanced approach between short- and long-term actions so as to ensure rapid response but at the same time build long-term capacity and d) to ensure the efficiency of the coordinated response through regular monitoring and evaluation.

In the most recent International Ministerial Conference on Avian and Pandemic Influenza held in New Delhi in December, 2007, it became apparent that, despite progress made towards controlling HPAI infection in many infected countries, there were several countries where the H5N1 HPAI had become entrenched. The current state of veterinary services and preparedness levels in these and many other developing and in-transition countries posed a serious threat to the prevention and control of HPAI and other infectious diseases. Thus, it was recommended as a priority that substantial investment be made to continue to support the ongoing efforts to control of HPAI.

It was also recognized that HPAI was one of a series of emerging infectious diseases (EID) that would continue to appear on a regular basis with unpredictable consequences and with the potential to cause huge epidemics and even pandemics. Thus, the New Delhi Conference also proposed that the global community needed to

¹ International Pledging Conference on Avian and Human Pandemic Influenza, Beijing, China, 20 December 2005.

begin to address, simultaneously with HPAI, the larger problem of EID. In order to avert a repetition of the H5N1 HPAI-type crisis, there was a need to better understand the broader issues around the emergence and spread of EID, the challenges of establishing partnerships across sectors and with multiple stakeholders, the socio-economic dimensions and impacts, the policy constraints and the long-term technical capacity building to detect and control diseases rapidly. Since many EID are zoonotic and most of the recent outbreaks of new infectious diseases have had their origin in wild animals, it was recommended that a more holistic, global approach was needed, taking into account the interfaces among human, animal and ecosystem health domains. It was proposed that the broad principles described under the 'One World, One Health' (OWOH) perspective that places the health issues in the broader developmental and ecological context be used as the basis for addressing current and future threats and problems of EID (Wildlife Conservation Society, 2004). While the OWOH concept is not new, it has recently gained international attention and momentum through a series of initiatives in Europe and the US. This approach can be defined as:

“[t]he collaborative efforts of multiple disciplines working locally, nationally and globally to attain optimal health for people, animals and our environment.”

(American Veterinary Medical Association, 2008, p. 13)

In response to this recommendation, this Strategic Framework has been developed to address the potential threat of EID at the animal–human–ecosystems health interface, particularly those that are transboundary in nature and have the potential for wide-ranging global impacts. The Framework specifically focuses on cross-sectoral collaboration and involvement of multiple stakeholders at the country, regional and international levels using different technical and policy options and capacity building for infectious diseases. The Framework also supports the development of a comprehensive and coherent communication strategy, designed to win and sustain political, public and private support for the OWOH approach.

2 Achievements and lessons learned from HPAI and their relevance to EID

2.1 Current status

A global analysis of the situation between January and June 2008 indicates fewer outbreaks and fewer infected countries compared with the same period in 2006 and 2007 (FAO, 2008). In parts of Asia and Africa, the virus is actively circulating in some countries, particularly where the disease is entrenched. Several countries in the world, particularly in Sub-Saharan Africa and Asia, remain at risk of infection, and early warning, surveillance and preventive measures need to be maintained.

Since 2003, a total of 61 countries have reported H5N1 HPAI in domestic poultry or wild birds. The total toll in human cases now stands at 387, inclusive of 245 deaths (as of September 2008)—a very high mortality rate. Despite the overall reduction in HPAI outbreaks, the risk of a worldwide influenza pandemic remains, with the potential to cause human deaths accompanied by severe social, economic and humanitarian consequences.

2.2 Achievements of the ongoing HPAI response

Since the first major outbreaks in late 2003 and early 2004, considerable progress has been made in controlling HPAI worldwide. Since 2006, the global response has been generally underpinned by Beijing Principles. Some major achievements are:

- Growing adoption of the Beijing Principles by the global community has resulted in a clearer approach, has avoided duplication and waste of resources and has ensured that donor assistance has been channelled to directly support the Integrated National Action Programs (INAPs) developed and owned by countries affected or threatened by avian and human influenza (AHI).
- Technical and financial support for INAPs has substantially improved cooperation between public and animal health agencies. While respecting the mandate and comparative advantage of public and animal health agencies, the INAPs have helped to identify areas of intervention for which inputs from both agencies were critical.
- The resources provided to build underfunded public and veterinary health services have already resulted in improved surveillance systems, better diagnostic laboratories, more skilled human resource in public and animal health sectors, improved response capacity to respond to further HPAI and other infectious disease outbreaks, and increased public awareness and behaviour change in at-risk communities in many countries.
- Communications specialists from the United Nations Children's Fund (UNICEF), World Health Organization (WHO), non-governmental organizations (NGOs), civil society, governments and other organizations have been able to launch creative and effective campaigns that resulted in increased awareness of HPAI and some evidence of behaviour change in communities at risk.
- The three International Ministerial Conferences on Avian and Pandemic Influenza (Beijing, Bamako and New Delhi)² held over the last two-and-a-half years have helped to mobilize over US\$2.7 billion (US\$1.5 billion already disbursed) and have also helped to raise awareness of HPAI; inter-sectoral political commitment from many countries has also been strengthened.
- The cooperation among the four technical agencies (WHO, Food and Agriculture Organization [FAO], World Organisation for Animal Health [OIE] and UNICEF), with the international financial institutions (the World Bank, Asian Development Bank and African Development Bank) and other bilateral and international donors has been unprecedented, and in most cases exemplary. Although global public interest in HPAI has declined, collaboration—particularly at the country and operational levels—remains strong.
- The AHI response has also raised awareness of the importance of emerging and re-emerging infectious diseases among politicians and donors worldwide.

2.3 Lessons learned

The major lesson learned is the central importance of efficient surveillance, effective intersectoral collaboration, a well-designed national strategy and sustained political

²Beijing, China, January 2006; Bamako, Mali, December 2006; New Delhi, India, December, 2007.

will. Where any of these elements has been absent or insufficient, countries have been less able to detect and control the spread of infection, with the result that in some countries the disease has become entrenched in poultry, thereby increasing the possibility of human infection.

Experience from the AHI response underscores the importance of investing in effective disease surveillance at the human, animal and ecosystem levels, enabling countries to respond to a range of existing and emerging infectious diseases.

The country focus has been critical to the success of the AHI response

In supporting the global effort to control HPAI, the focus has been on countries developing their own INAP, with clearly defined roles and responsibilities for the various sectors and stakeholders. This approach has enabled better coordination of donor support and has avoided duplication of efforts. The country focus has also contributed significantly to the development of essential capacity, particularly in the areas of the much-neglected and underfunded public and animal health sectors. The emphasis on country leadership has been further boosted by the provision of critical support and guidance by the technical agencies. A shared strategy at the national level has also enabled better monitoring and evaluation of the plan, resulting in regular refinement of the national strategy according to changing circumstances.

Shifting country priorities

Many countries, whether they are endemic, have repeated incursions of HPAI, or are not infected, have begun to develop effective emergency response mechanisms as well as long-term capacity to control infectious diseases. This underscores not only the important overall improvements made by many countries in successfully implementing their national plan, but also indicates that the emphasis is shifting away from a crisis response to a focus on building systems and capacity that can respond effectively to future outbreaks of AHI other infectious diseases. The transition away from short-term responses towards more sustainable capacity and systems strengthening shows the potential utility of consolidating and broadening this approach to focus on all infectious diseases at the animal–human–ecosystems interface.

The emphasis on systems strengthening in the animal health sector has been significantly assisted by the OIE-PVS Tool for the Evaluation of Performances of Veterinary Services (PVS), which allows countries to undertake a comprehensive evaluation of their veterinary services and identify gaps and areas requiring strengthening in order to meet international standards. The OIE and FAO, in cooperation with the World Bank, the European Commission, US Department of Agriculture (USDA) and other donors, are supporting ‘Gap Analysis of PVS Outcomes: Evaluation of Needs and Priorities’³ for the preparation of national investment programs driven by the countries’ contexts and priorities (including epidemiology, risk analysis and capacity building).

³ ‘Gap Analysis of PVS Outcomes: Evaluation of Needs and Priorities’ is the full name of ‘PVS Gap Analysis’. It is based on the evaluation outcomes, using the PVS Tool, of performances of national veterinary services and is used to specify the actual needs of the countries, on a case by case approach, to meet OIE international standards on quality of veterinary services with the direct involvement of countries concerned, as regards the priority-setting process.

Understanding epidemiology and the role of wildlife

Comprehensive and continuing epidemiological studies are required in many countries—particularly in those countries where HPAI is endemic—to better understand the infection and transmission dynamics in wild birds, ducks, chickens and humans. Additionally, there is a need for a more structured approach to virus characterization in different farming systems and epidemiological situations in order to better understand genetic evolution and its impact on virus behaviour. Similarly, it is necessary to understand local, regional and international market systems, as well as the magnitude of traffic and the dynamics of viruses along these market chains, to better tailor strategic control programs.

Mapping and surveillance of wild birds and avian influenza viruses have improved the overall understanding of the role of migratory birds and the mode of transmission and emergence of new infections. This has enabled several countries to better target their disease control programs and move towards eradication. Strategic research in collaboration with the wildlife sector is needed to better understand the factors that contribute to inter-species pathogen transmission among all species (i.e. the ‘species barrier’).

More generally, in the context of OWOH approach to EID control, there is little or no collaboration at all levels with institutions such as Wildlife Conservation Society (WCS), World Wildlife Fund (WWF), International Union for Conservation of Nature (IUCN) and NGOs that deal with wildlife, environmental and ecosystems health. The OWOH approach will require significant investment to promote these new partnerships.

Effective communication strategies are essential

Communication activities are a central crosscutting element of any national strategy. Where communications strategies have been most effective, they have brought those working in both animal and human health together with NGOs and civil society to develop comprehensive and consistent campaigns that target messages to critical audiences. Although most communications strategies have focused on the short-term objectives of raising awareness of the AHI threat and on measures to reduce the risk of infection, there is already evidence of behaviour change in some operations.

As the response evolves, increasing attention is being paid to the role of communications in pandemic preparedness and to campaigns targeting measures to promote hygienic practices at slaughter points and wet markets. These activities—and the long-term objectives they address—illustrate the need for sustained and predictable funding for communications activities. Although there is a widespread concern for insufficient funding in this area, some countries have managed to undertake highly creative and sophisticated communication campaigns.

Flexible design and medium-to long-term financing frameworks are critical to the success of global and national HPAI control programmes

As part of their Global Program for Avian Influenza (GPAI), the World Bank manages the AHI facility in collaboration with the UN System Influenza Coordinator (UNSIC). The GPAI has a number of features that are noteworthy in the context of the progress made so far. These include supporting countries to develop their own well-structured and detailed national integrated plans, providing a longer (three-year) financing framework, accommodating a flexible approach to the use of the funds

beyond emergency response, and ensuring that the national plans, programmes and integrated projects are aligned to the institutional structures and mandates of the countries and the international organizations.

This approach has resulted in a strong country ownership of decision-making towards implementation, a more coordinated and efficient mobilization and targeting of funds, improved capacity to handle not only the immediate emergency of HPAI but also other infectious diseases at the animal–human–ecosystems interface, and strong synergy with the international organizations and institutions involved in HPAI control.

Intersectoral collaboration and partnerships remains critical

Recognizing the multidimensional nature of HPAI and EID, which involves different health domains and socio-economic dimensions, there is a need for both a wide range of stakeholders and to promote strategic collaboration and partnerships across various disciplines, sectors, departments, ministries, institutions and organizations at the country, regional and international levels. Where collaboration has been most effective, there has been a clearly articulated strategy and respect for the specific roles and mandates of the partners involved. Facing the imperative to respond in an emergency, collaboration around compatible functions—such as virus epidemiology, diagnostics, research, training or communication—has been relatively easy to achieve, but sustaining this once the immediate threat has subsided poses a significant challenge.

The emergence of significant cross-sectoral partnerships following the recent global HPAI crisis is quite encouraging.

At the international level, the high level of collaboration and synergy among the key UN agencies (FAO, WHO and UNICEF) and OIE following the HPAI crisis has been previously unknown. These institutions have demonstrated flexibility in their ability to adapt or develop new administrative structures and mechanisms within and across their organizations to respond to the HPAI crisis. For example, FAO was able to establish the Emergency Centre for Transboundary Animal Diseases (ECTAD), with the specific objective of rapidly mobilizing resources from within FAO to address the emergence and spread of HPAI in Southeast Asia in 2005.

Since then, international agencies have partnered in many initiatives to address HPAI and other EID. These include the Global Early Warning System (GLEWS), set up as a joint FAO/OIE/WHO platform in July 2007; the OIE-FAO Network of Expertise on Avian Influenza (OFFLU), in which OIE and FAO support exchange of knowledge between veterinary laboratories and WHO and its collaborating centres; the Crisis Management Centre (CMC-AH), launched in 2006 jointly by FAO and OIE to respond rapidly to transboundary animal disease (TAD) and EID crises; and a common UN system for avian and pandemic influenza control and prevention under UNSIC, created in mid-2006. This collaboration not only brings together the collective contribution of the UN system but also ensures that UN agencies are able to provide coordinated assistance in areas of specialization; for example, UNICEF provided global support in promoting education and communication for control and prevention of HPAI. These structures have served to provide a unified international approach and have facilitated the successful implementation and delivery of HPAI and other infectious disease control programs globally.

Even prior to the emergence of HPAI, FAO and OIE (in collaboration with WHO) had launched the Global Framework for the Control of Transboundary Animal Diseases (GF-TADs), which provided a clear vision and framework within which to address the issue of existing and emerging infectious diseases. The GF-TADs is widely relied upon and has been officially endorsed by all participating organizations and their member states (FAO in December 2003 and OIE in May 2004). This framework has been pivotal in many ways in supporting and building new mechanisms for HPAI control, as described above.

A strong collaboration and coordination has also emerged between the international agencies, countries and donors. For example, the World Bank manages and implements the GPAI, and the AHI facility partners with the three UN agencies: FAO as the first responder agency to address control and containment in poultry, WHO as the second responder to develop pandemic preparedness, and UNICEF to promote communications. The OIE is also an important international partner in providing leadership in international regulatory guidelines and standards, disease reporting and assessment of veterinary capacity. Other partners include bilateral agencies and NGOs. In many countries, the UN serves as the coordinator to the donor community to organize assistance, avoid duplication, allocate and manage resources, and liaise with host governments.

Several donors have also specifically encouraged greater cooperation among the technical agencies. Key among these are the Asian Development Bank, United States Agency for International Development (USAID), Japan, Germany, the Canadian International Development Agency (CIDA) and the European Community (EC). CIDA is currently financing the *Joint Programme on the Management of Avian Influenza and Other Zoonotic Diseases*⁴ with WHO, FAO and OIE as partners, and it includes support for GLEWS.

At the regional level, under the umbrella of GF-TADs, significant progress has been made to engage regional organizations—e.g. the Association of Southeast Asian Nations (ASEAN), South Asian Association for Regional Cooperation (SAARC) and the African Union Inter-African Bureau for Animal Resources (AU-IBAR)—to form regional animal health centres and to establish regional networks in surveillance, diagnosis, socio-economics and communication. Such centres are enhancing collaboration among countries with commonly defined problems under the political and socio-economic context of the regional organizations, enabling greater influence on policies to support regional approaches to infectious diseases.

- **In Asia**, ASEAN has developed a unified and harmonized regional strategy on HPAI that has resulted in greater collaboration among the member countries, particularly in the sharing of information and experiences through the establishment of diagnostic and surveillance networks. The Association of Southeast Asian Nations plus China, Japan and the Republic of Korea (ASEAN+3) Emerging Infectious Disease Program and the ASEAN Sectoral Group on Livestock are playing an increasingly stronger role in EID control programs and are working closely with member countries and international agencies to support regional coordination mechanisms and to promote stronger partnerships between the public and animal health sectors. The EC is currently

⁴ 'Joint Programme in Strengthening the World Health Organization (WHO), the Food and Agriculture Organization (FAO), and the World Organization for Animal Health (OIE) cooperation in the Management of Avian Influenza and other Zoonotic Diseases' (2006–2012)

considering a four-year *Regional Cooperation Programme⁵ on Highly Pathogenic and Emerging and Re-emerging Diseases in Asia*, with the participation of WHO, OIE, FAO, SAARC and ASEAN.

- ***In the Americas***, there is an over 20-year tradition of Inter-American Meetings, at Ministerial Level, on Health and Agriculture (RIMSA), in which a range of stakeholders participate, including the private sector and consumers. Recommendations from these meetings are brought to the governing bodies of the WHO Regional Office for the Americas / Pan American Health Organization (AMRO/PAHO).
- ***In Sub-Saharan Africa***, a good example of regional cooperation between different agencies is the cooperation between the African Partnership for Livestock Development, Poverty Alleviation and Sustainable Growth Initiative (ALive) and GF-TADs in implementing ongoing INAPs on AHI in Sub-Saharan Africa. ALive's INAP on avian and pandemic influenza in Africa has become a rallying point and mechanism of regional cooperation among technical (AU-IBAR, FAO, OIE, and WHO/AFRO) and donor (EC, the French Ministry of Foreign Affairs, and the World Bank-Africa Region) institutions committed to the prevention and control of avian influenza in Sub-Saharan Africa. Funded by the EC and the French Ministry of Foreign Affairs and hosted by the World Bank, the ALive INAP program provides technical assistance to governments in Sub-Saharan Africa towards the rapid assessment of AHI prevention and control capacities, with guidance from ALive experts and technical consultants from each of the partner institutions (AU-IBAR, FAO, OIE, and WHO/AFRO), and towards developing recommendations on improving such capacities contained in a draft INAP. Following government endorsement, ownership and implementation of the INAP rests solely in the government. ALive also provides assistance to the government in accessing international funding (i.e., from the World Bank and other donors) for financing INAP implementation. This coordinated approach for the AHI program in Sub-Saharan Africa is an example of best practice in international collaboration among donors and technical institutions.

Some challenges remain

However, in most countries a number of institutional and administrative problems still exist. In these countries, collaboration between the health and animal sectors and across various line ministries is difficult or often lacking. This is further compounded by lack of political and financial commitment to address EID problems. In some countries, the decentralization of authority at the provincial level severely limits the effectiveness of national strategies to control HPAI and other infectious diseases of national and regional importance. In addition, many low-income countries have limited or no human resources to support countrywide surveillance and response capacity to deal with crises caused by highly infectious diseases. Many countries also have had difficulties in engaging the private sector to support national disease-control programs. While this situation has improved for some, there is huge variability in the institutional capacity of many countries to participate in EID control without substantial long-term investment aimed at strengthening existing institutions, basic

⁵ Draft EC project: 'Regional Cooperation Programme on Highly Pathogenic and Emerging and Re-emerging Diseases in Asia' (2009–2012)

education, communication campaigns to promote behaviour change and supporting networks of institutions to improve cross-sectoral collaboration.

3 Emerging and existing infectious diseases and their impacts

Many emerging and existing infectious diseases concern the global community because of their epidemic and endemic potential and their wide-ranging socio-economic impacts. Some of the most recent examples of EID are Nipah virus infection in humans and animals, severe acute respiratory syndrome (SARS) in humans and H5N1 HPAI in domestic poultry, wild birds and humans. Other EID will emerge in the future unexpectedly and may disperse rapidly and widely.

In 1999, Nipah virus outbreak in Malaysia destroyed the swine industry, while the associated human fatalities simultaneously created massive public panic. This ‘new’ virus was found to have been dormant in fruit bats for decades and only emerged through a complex interaction of factors such as habitat destruction, climatic events and the encroachment of food-animal production into wildlife domains. The 2003 outbreak of SARS infected about 8,000 people in China (including Hong Kong and Taiwan), Canada, Singapore, and Viet Nam, but cost Asian countries between US\$30–50 billion, mostly due to economic repercussions from widespread public fear of the disease. The true cost of HPAI is still being evaluated. One estimate suggests that a human influenza pandemic today would cost roughly US\$2 trillion.

There are also many existing infectious diseases of domestic food-producing animals that cause huge socio-economic impacts. Some of these remain endemic in many developing countries, where they have been neglected. Foot and mouth disease (FMD), for example, remains endemic in large parts of Latin America, Africa and Asia, causing huge production losses and adversely affecting the livelihoods of poor farming communities. FMD also seriously threatens the trade prospects of developed and emerging economies.

Several vector-borne diseases at the animal–human interface are emerging in new countries and regions with potential to cause epidemics. Recently, Rift Valley fever (RVF), West Nile fever (WNF), bluetongue, Q-fever and dengue have emerged in new areas and regions, stressing under-resourced veterinary and public health services.

There are also existing food and water-borne infectious diseases such as bovine spongiform encephalopathy (BSE) in cattle, variant Creutzfeldt-Jakob disease (vCJD) in humans, cholera, salmonellosis, hepatitis A, noroviruses, trichinellosis and echinococcosis, which are associated with the way food animals are produced and with food hygiene practices during transformation, preparation and marketing.

Factors contributing to the emergence, spread and entrenchment of infectious diseases

Several interrelated factors and global trends contribute to the emergence, spread and entrenchment of infectious diseases. Arguably, the most fundamental factor is the dramatic increase in human population, projected to rise to 8 billion by 2025 (mostly in Asia, Africa and Latin America, where most of the world's poor live). This trend is likely to result in more poor people in absolute terms. At the same time, some Asian countries are experiencing strong economic growth, with rapidly urbanizing populations and greater demand for food, particularly of animal origin. Termed the

‘livestock revolution’ (Delgado et al., 1999, 2001), this phenomenon is driving rapid change in farming systems. In 2008, over 21 billion food animals were produced to help feed a population of over six billion people. By 2020, it is expected that the demand for animal protein will increase by 50 percent, with most of that demand coming from developing countries.

Due to increased poverty, the proximity of increasingly concentrated smallholder farming communities to intensified, industrial farming systems is growing, creating conditions conducive for disease emergence and entrenchment. Lack of biosecurity and poor sanitary standards in these farming systems and market chains will be a major factor in the emergence and spread of infectious diseases. Such systems, which are often concentrated near urban environments, will enhance contamination of drinking water by coliform and other potential disease agents. The rise in a smallholder farming sector with poor biosecurity, as well as the settlement of poor farming communities in the peri-urban areas, will create endemic disease foci that will become major sources of pathogens, contributing to the constant threat of disease emergence.

Increased population is also putting pressure on land use, with further encroachment on natural forests and their rich and diverse fauna. This, together with the consumption of ‘bush meat’, the increasing demand for exotic meat and the concurrent farming of game animals will increase the exposure of domestic animals and humans to new pathogens originating from wildlife.

Climate change, particularly global warming, has changed the ecosystems in many regions and has subsequently extended the distribution of several vectors that transmit diseases such as RVF, WNF, bluetongue, dengue and malaria.

Both human and animal population densities are central to enhanced transmission, amplification and spread of newly emerging pathogens. In the last 10–15 years, duck and chicken production has quadrupled in China, and this has had a significant impact on the emergence and spread of H5N1 HPAI. In addition, frequent and extensive movement of humans, and an increase in unsafe trading of animals (both domestic and wild) and their products locally, regionally and internationally are major factors in the spread of (re-)emerging diseases. It is estimated that over the next 20 years, international travel will increase annually by 5 percent. In addition, the global trade in live exotic animals, estimated to stand at US\$4–6 billion, is growing. The outbreak of monkey pox in the USA was attributed to the contact of imported African rodents with native prairie dogs and humans.

4 The Strategic Framework

The global Framework has been developed specifically to address the risk of EID at the animal–human–ecosystems interface with significant transboundary socio-economic impacts, while continuing to control H5N1 HPAI.

4.1 Goal

The Strategic Framework’s goal is to diminish the threat and minimize the global impact of epidemics and pandemics due to highly infectious and pathogenic diseases of humans and animals, underpinned by enhanced disease intelligence, surveillance and emergency response systems at the national, regional and international levels, and

supported by strong and stable public and animal health services, and wildlife monitoring at the country level.

The goal will contribute to the larger vision of improving public and animal health, enhancing food safety and food security, improving the livelihoods of poor smallholder farming communities and protecting the health of ecosystems.

In order to achieve this goal, significant strategic shifts must be made in the approach to infectious disease control, in six important ways:

- Initiating more preventive action by dealing with the root causes and drivers of infectious diseases, particularly at the animal–human–ecosystems interface
- Building more robust public and animal health systems that are based on good governance and are compliant with the International Health Regulations (IHR) 2005 (WHO, 2005) and OIE international standards, with a shift from short-term to long-term intervention
- Strengthening the national and international emergency response capabilities to prevent and control disease outbreaks before they develop into regional and international crises
- Better addressing the concerns of the poor by shifting focus from developed to developing economies, from potential to actual disease problems, and to the drivers of a broader range of locally important diseases
- Promoting wide-ranging institutional collaboration across sectors and disciplines
- Conducting strategic research to enable targeted disease control programmes.

4.2 Overall objective

The overarching objective of the proposed Strategic Framework is to diminish the threat and minimize the global impact of diseases of animal origin, including zoonoses and those with pandemic potential. This will be achieved by consolidating the current effort of strengthening public and animal health systems at the country level and enhancing their collaboration in areas of common interest (focusing on current and future ‘compatible’ functions in disease intelligence, surveillance, early detection, diagnosis, rapid response, education and research), supported by the regional and international levels and in compliance with international regulations (IHR and OIE standards).

4.3 OWOH perspective and its relevance to this Strategic Framework

The OWOH approach articulated in the Manhattan Principles (see Annex 1) recognizes the intimate linkages among the human, animal and ecosystem health domains. It proposes an international, interdisciplinary, cross-sectoral approach to disease surveillance, monitoring, prevention, control and mitigation of emerging diseases, as well as to environmental conservation.

Therefore, the OWOH approach provides a good foundation for this Framework. Pooling resources in a targeted manner will lead to economies of scale and enable us to address common problems across systems in a targeted manner without duplication. Some of the advantages and challenges of the OWOH approach are described in Annex 2.

The recent global HPAI crisis has stimulated significant cross-sectoral partnerships that can be built upon, taking into account the larger ecological context of infectious diseases and the broader socio-economic background. This approach should improve our capability to prevent disease, rather than simply react to new outbreaks as they emerge. In many ways, the success of the Strategic Framework will hinge on putting the OWOH approach into practice in its broad sense.

To support the OWOH approach, a targeted and effective communication strategy will also be designed and implemented to foster and support dialogue, partnership and ownership, to influence policy and to build political commitment. Engagement and support of rural communities will be vital to the success of these strategies.

4.4 Guiding principles

The Strategic Framework will be guided by these key principles:

- Prevention and control of EID is an **international public good** and requires strong political and financial commitments at national, regional and international levels
- A **long-term vision** is needed to address issues of public good, beyond the normal 3–5-year political time horizons
- A **holistic and global approach** to addressing EID is essential
- Actions could build on **existing institutions** and their **mandates** wherever possible and draw on lessons learned to refine strategies and interventions
- A **multidisciplinary approach** is needed to integrate technical, social, political, policy and regulatory issues in addressing EID
- **Different perceptions on disease** must be respected, especially those of the front-line players: farmers, traders, public and animal health extension workers, and the private sector
- **Pro-poor interventions** for infectious disease control must be supported to ensure that the livelihoods and health of farmers are protected and improved
- There may be difficult **trade-offs** in the long term, but practical **win-win** solutions across sectors can be found in the short term
- Because **the risk of EID will persist**, there is a need to strengthen national and international emergency response capabilities
- The Framework should be **science-based** and continually adjust to new information and technologies and to the changing environment
- The Framework must be **communicated** adequately so that it is understood by the local community, especially in the case of **incentives**.

4.5 Prioritization

The Strategic Framework will aim to set priorities for actions and interventions at the country, regional and international levels based on a number of criteria that will include feasibility, benefit–cost analysis of different options, financial viability, the types of impact and long-term sustainability.

4.5.1 Identifying priority actions

Establishment of global risk-based surveillance systems for existing and emerging infectious diseases with epidemic potential at national, regional and international levels will be a major priority. Risk-based surveillance may be targeted in certain countries or regions based on the identification of high-risk areas, or ‘hotspots’, where multifactorial conditions exist for emergence and entrenchment of diseases. Hotspots can be defined as areas where several factors converge to create high-risk disease emergence and spread zones, and where weakening or deteriorating public and animal health systems and inappropriate institutional conditions mean that disease has a high chance becoming entrenched. These factors include the presence of dense human and animal populations, increased contact among human, wild and domestic animals, changing farming systems, and areas of poor sanitary conditions, especially in peri-urban settlements and farming communities. The countries with entrenched H5N1 HPAI serve as a guide for identifying some hotspots, but there are also likely to be other hotspots developing as existing balances in animal–human–ecosystems health domains are disturbed.

The scientific basis for targeting surveillance for EID has been established by the close association with high human population densities and growth (Jones et al., 2008). EID events caused by zoonotic pathogens from wildlife, non-wildlife, drug resistance and vector-borne pathogens are all prominent in East and South Asia (ibid.). FAO estimates that China alone holds half the world’s standing population of domestic pigs. Poultry are also prominent there, with an estimated 6.5 billion birds including chicken, ducks and geese. South Asia—India in particular—represents the world epicentre for ruminants, with 0.6 billion head.

However, enhanced surveillance capacity cannot yet be deployed in all or even in those countries with hotspots, because most have generally poor or inadequate public and animal health services and deficient regulatory controls. Therefore, capacity building for basic human and animal health services and the establishment of sustainable surveillance capacity in countries and internationally will be a major long-term priority.

4.5.2 Targeting specific diseases

While the principal focus of this Strategic Framework will be on the prevention of EID with epidemic potential, it will also address a number of other existing infectious diseases that are transboundary in nature and that have significant socio-economic impacts. Control and prevention of such diseases is an international public good (see section 4.8) and therefore requires long-term investment from private and public sources. HPAI will continue to be a major priority because of its pandemic potential.

It is also evident that setting up surveillance systems to detect the emergence of new infectious diseases is not always a priority for poor communities and smallholder farming sectors, which are generally hotspots for EID. Thus, the Framework will set up risk-based surveillance systems, using as examples infectious diseases that impact on the well-being of poor communities and farmers (see Annex 3 for the GLEWS list of key diseases). Surveillance systems at the grassroots level that are based on engaging poor communities by addressing their immediate disease problems are likely to generate better cooperation and will be more robust and sustainable in the long term. This approach will not only benefit the management and control of existing priority diseases that impact on the poor but also other EID.

4.6 Burden of disease, benefit–cost analysis and costing strategies

To be able to prioritize actions and interventions in the context of addressing emerging and existing infectious diseases, it is important to quantify the burden of disease. This would require identification and assessment of costs, potential benefits and trade-offs. There are considerable challenges to doing such assessments, even within sectors where a range of methodologies are used and debated; to address new diseases that have not yet emerged; and to identify whether control of the disease represents a private or public good (or a local or international concern).

The Framework will incorporate broad-based impact assessment, including socio-economic assessment, as part of its prioritization strategy. Recognizing that in the context of an OWOH approach, the number of actors and complexities multiply and the range of stakeholder perceptions, disciplinary differences and methodologies in measuring costs and benefits increases; therefore, considerable cross-disciplinary discussion in assessing trade-offs across sectors (who should pay for what) is needed.

On the other hand, a broader cross-disciplinary assessment—one that also incorporates the costs that can be shouldered by the private sector, with the incentive of creating private benefits—may reveal new areas of efficiency. This should incorporate the recognition that tackling groups of common diseases (especially in the animal health sphere) would be of greater benefit in developing countries; this approach may be more attractive to farmers and local authorities, and could reduce overall public costs.

4.7 The public-private good dimension at different levels

In order to determine who pays for what actions and interventions for addressing a number of issues such as capacity building, surveillance, public and animal health services, laboratories and wildlife ecosystems health management at all levels (national, regional and global), it is important to define public and private goods. In general, a *private good* is one for which an individual or a group of individuals can be clearly defined as sole beneficiaries and where the user of a service or resource by one person prevents its use by others. Conversely, a *public good* is one in which the benefits cannot be confined to a particular user or group of users. Global public goods cannot be addressed adequately by individual countries and therefore require international consensus. These definitions are expanded further in section 8.2.1.

Preventing emergence and cross-border spread of human and animal infectious diseases is considered to be a global public good. Control of HPAI is recognized as an international public good, as evident from its level of significant global grant funding to date. Surveillance systems that underpin the prevention of emergence and spread of such diseases are also recognized as a global public good. As it is not clear what a disease's potential is until after it has emerged, surveillance for potentially pandemic EID is clearly a global public good.

In most cases, producing a global public good will require action by international institutions, including building on, reinforcing and often coordinating national action; channelling funds to national programs; monitoring and reporting on progress; and in a growing number of issue areas, considering and implementing decisions taken at a global level. Thus, the quality and management of international institutional capacities are vital for the provision of global public goods.

4.8 Role of international agencies in addressing global public goods

WHO, FAO, UNICEF and other UN agencies, and OIE have explicit mandates to deal with a broad range of global public goods in terms of knowledge, guidance, harmonization and advocacy of the UN Millennium Development Goals (MDGs).

The present IHR were adopted in 2005 and came into force in 2007. The objectives of the IHR are:

“[t]o prevent, protect against, control and provide a public health response to the international spread of disease in ways that are commensurate with and restricted to public health risks, and which avoid unnecessary interference with international traffic and trade.”

(WHO, 2005, p. 1)

The IHR provide a new framework for the coordination of events that may constitute a public health emergency of international concern, and for improving the capacity of countries to assess and manage acute public health risks. Unusual disease events—including zoonoses—need to be addressed by effective national surveillance and the establishment of coordinated response mechanisms at all levels (local, national, regional and, when needed, international) should also be supported. Under the IHR, Member States have an obligation to communicate with WHO through designated National IHR Focal Points regarding events that meet certain criteria. The IHR also sets out a legal, transparent obligation for States Parties to meet core capacities for national surveillance and response.

Similarly, the OIE standards (OIE Terrestrial Animal Health Code⁶, the OIE Manual of Diagnostic Tests and Vaccines for Terrestrial Animals⁷, the Aquatic Animal Health Code⁸ and Manual of Diagnostic Tests for Aquatic Animals⁹ and the OIE International Standards on Quality of Veterinary Services¹⁰) provide appropriate guidance and protocols on information sharing and guidelines to address EID.

FAO and WHO share the Codex Alimentarius Commission, which develops food and feed standards and provides guidelines and codes of practice with the aim of protecting the health of consumers, ensuring fair trade practices in the food trade, and promoting the coordination of all work food standards undertaken by international governmental organizations and NGOs. FAO, OIE and WHO also define and regularly update guidelines for good practices, methods, tools and strategies for infectious diseases, focusing on developing countries and/or endemic areas.

Inter-agency collaboration has significantly increased between the human and animal health sectors (see Annex 4), particularly following HPAI outbreaks. Several organizations were created and have served to increase harmony in global approach, including UNSIC; the CMC-AH, which works closely with its counterpart in WHO; GF-TADs; OFFLU; GLEWS; and the FAO/WHO International Food Safety Authorities Network (INFOSAN). These and other mechanisms, such as the Mediterranean Zoonoses Control Programme (MZCP), can be further strengthened and new ones created in the context of this Strategic Framework. For example, FAO has been working with wildlife organizations to examine wildlife–HPAI linkages.

⁶ http://www.oie.int/eng/normes/mcode/en_sommaire.htm

⁷ http://www.oie.int/eng/normes/mmanual/A_summry.htm

⁸ http://www.oie.int/eng/normes/fcode/en_sommaire.htm

⁹ http://www.oie.int/eng/normes/fmanual/A_summry.htm

¹⁰ http://www.oie.int/eng/normes/Mcode/en_titre_1.3.htm

Under the OWOH approach, the international agencies will expand this collaboration with the wildlife sector, for example with the WCS, WWF, IUCN and NGOs.

4.9 Building on existing institutions and their unique strengths

This Strategic Framework will build on the existing approaches and mandates of international institutions and other partners to form a flexible network, which is expected to be nimble enough to be able to adapt, form new coalitions and respond rapidly to any new health emergencies. Internationally, these would include building on a number of structures and mechanisms that have been already established by the specialized international agencies such as FAO, OIE, WHO and UNICEF (as outlined in section 4.8). The Framework does not see the integration or fusion or roles among different specialized international agencies; rather it seeks improved communication, coordination and collaboration.

5 Specific objectives and outputs

To address the overall goal of the Strategic Framework, six specific inter-linked objectives and their outputs were identified. Under these objectives, several activities are envisaged; some of these will be new while others can be linked with a number of ongoing activities on HPAI and other infectious disease control programmes. More detailed analysis of funding requirements are presented in Chapters 7 and 8.

5.1 Objective 1: Develop surveillance capacity, including the development of standards, tools and monitoring processes at national, regional and global levels

Global surveillance capacity is the ability to bring together and add intelligence to the national and regional surveillance data. Surveillance is fundamental to all disease control efforts, including ongoing risk assessment. Limited global capacity necessitates targeted surveillance that places additional resources in the highest-risk areas for disease emergence and spread. Thus, vulnerability/risk research to identify and map disease hotspots would be an important component of this objective. Cross-border and regional surveillance are a vital complement to national surveillance for transboundary diseases. These may require bilateral and multilateral legal agreements at the regional level, backed by adequate national veterinary and public health regulations and the capacity to enforce these regulations. However, this requires political consensus among several countries globally, across a region or a sub-region.

Regional organizations, such as the European Community (EC), Economic Cooperation Organization (ECO), Organismo Internacional Regional de Sanidad Agropecuaria (OIRSA), ASEAN and ASEAN+3 in Southeast Asia and East Asia, the Asia-Pacific Economic Cooperation (APEC) and SAARC in South Asia, and AU-IBAR and other subregional organizations such as the South African Development Community in Africa can play an important role in promoting cross-border and regional surveillance programmes. ASEAN's 10 member countries, for example, have developed a system that will enable sharing of disease information and livestock production data. The America Region has a 20-year tradition of RIMSAs that include the private sector and consumers; recommendations are brought to the governing bodies of the PAHO. There is also the WHO MZCP, which has supported capacity

building for zoonoses prevention, surveillance and control to ministries of health and agriculture of countries from the European and Eastern Mediterranean Regions for more than 30 years. MZCP will soon become a joint WHO/FAO/OIE collaborative programme with a focus on training both public health and animal health professionals at the human–animal interface, and will seek to broaden its outreach to countries in more regions.

Thus, many internationally and regional institutional mechanisms are already in place among the key UN agencies and the OIE to harmonize and integrate disease information and analysis systems, in addition to domain-specific information. This resource can certainly be strengthened for the Strategic Framework. Expected key outputs are:

- a. Improved skills and competencies, from a grassroots level to district, provincial and national levels in all areas of disease surveillance
- b. Strengthened basic human and animal disease surveillance at district, village and farm levels in all at-risk countries, including the establishment of disease information systems at the country level and improved national diagnostic laboratories with access to standardized reagents
- c. Identification, mapping and characterization of hotspot areas
- d. Improved human and animal surveillance in hotspots and other at-risk areas, such as rapidly evolving farming systems, live-animal markets and highly mobile human and animal populations
- e. Risk maps and predictive geographic information systems (GIS)-generated models for rapid alerts and early detection of pathogens
- f. National risk-based surveillance systems in priority countries, with seamless information sharing among wildlife, animal and public health sector teams
- g. Communication strategies for enhancing disease recognition and reporting at the local level
- h. Enhanced international capacity in disease intelligence and analysis of disease emergence, horizon scanning, modelling, and forecasting, including further strengthening of the GLEWS initiative
- i. Established linkages and integration among information systems at the country level (e.g. the Transboundary Animal Disease Information System [TADinfo]), the regional level (e.g. the European Union Animal Disease Information System [ADIS], Regional Animal Health Information System [RAHIS]) and the international level (e.g. World Animal Health Information Database [WAHID], World Animal Health Information System [WAHIS]) and with other partners on wildlife conservation (e.g. Global Avian Influenza Network for Surveillance (GAINS) on avian influenza in wild birds) and NGOs.

5.2 Objective 2: Strengthen public and animal health capacity, including communication strategies to prevent, detect and respond to disease outbreaks at national, regional and international levels

Every country, with regional and global support, needs to have systems compliant with the IHR and OIE standards requirements. Most countries will need long-term

support to achieve this. In addition to strengthening surveillance, there is a need for prevention, disease intelligence, analysis of disease emergence, horizon scanning, forecasting and prediction, as well as contingency and preparedness planning, adequate to countering EID events globally. Huge country-to-country variation in health systems exists. In some countries it would be necessary to consider investment in basic and/or specialized veterinary and medical education to build skilled human resources, while in others it might be important to upgrade the standard of education to ensure that the medical and veterinary graduates are able to deal with advanced health systems.

Establishment of specific global support for sound health systems will also depend on good governance, appropriate institutions, central command, and strong support from private-public partnerships. The OIE and FAO are already supporting plans to strengthen national veterinary services of developing countries to comply with OIE standards¹¹, thereby ensuring good governance to address emerging and re-emerging animal disease threats and animal welfare, and to promote safe trade in livestock and livestock products. The World Health Assembly of WHO requires annual reports of progress in implementation of the IHR.

In addition, the capacity of the international agencies and the regional organizations needs to be strengthened to provide appropriate support to countries involved in infectious disease control. The types of regional and international support that underpin country-level control programmes are summarised below (see section 5.4).

A major area of concern is the assessment of and (re-)establishment of linkages between central and decentralized and privatized veterinary services, as well as with the local farming community. These linkages are vital to the rapid communication and response mechanisms essential to disease control. It is the responsibility of all governments to build and maintain efficient epidemiology surveillance networks and exhaustive national territorial meshing, potentially for all animal diseases, including zoonoses and emerging diseases. The expected key outputs are:

- a. Improved public and animal health services with good governance compliant with IHR and OIE standards, initially in countries at high risk for infectious diseases, and in the long term in all countries
- b. Developed policies and legislation supporting improved disease control by addressing a number of issues such as live-animal markets and slaughterhouses, biosecurity in smallholder systems, peri-urban livestock keepers, animal movement management, trade in livestock products, farming system policies and food safety
- c. Draft policies and programmes with feasibility and social acceptability analysis to provide the frameworks for countries to confront longer-term issues of disease emergence and persistence
- d. More and better-qualified professionals and community-based workers in public and animal health
- e. Enhanced regional institutions and mechanisms to promote cross-border and regional sharing of disease information, diagnosis and surveillance, and sharing of laboratory capacity

¹¹ Evaluation of Veterinary Services and Guidelines for the Evaluation and Performance of Veterinary Services

- f. Fully developed and implemented communication strategies for longer-term behaviour change and changes in social norms to support prevention and response capacities, with benchmarks for monitoring and improving national communication capacity
- g. International/regional policies to manage illegal trade activities: cross-border agreements (veterinary certification for animal movements, health and customs checks, animal health controls), regional policies on livestock trade and movement, and trade in wildlife
- h. Enhanced support from the international agencies to encourage countries in their development of animal and public health capacities. These initiatives will support countries in disease control: GF-TADs, which engages regional organizations to establish subregional or regional animal health centres and networks of regional and national epidemiology and surveillance; and the MZCP, which will expand its mandate beyond the European and Eastern Mediterranean Regions to other regions.

5.3 Objective 3: Strengthen national emergency response capability, including a global rapid response support capacity

While medium- to long-term plans for surveillance systems and capacity building are ongoing, there will be a need to respond to emergencies arising from outbreaks of infectious diseases. This will require broad capacity in financial and human resources notice at the country and international levels. Thus, the main outputs would be:

- a. Country and global level contingency and preparedness plans that include communication strategies
- b. Policies and appropriate legislation to support quarantine and movement control, humane animal culling and compensation mechanisms
- c. Availability of appropriate personal protective equipment and other equipment for outbreak investigation, culling, and medical/veterinary interventions, such as drugs and vaccines and facilities for their rapid distribution
- d. An established global emergency/compensation fund with clearly a defined purpose and implementation mechanisms through donor support
- e. Mobilization of rapid deployment teams such as those managed through CMC-AH and the Global Outbreak and Alert Response Network coordinated by WHO, or by national/regional organizations that have the appropriate equipment and tools to respond to disease outbreaks
- f. Trained personnel at the national level who are internationally available at short notice to deal with disease emergencies.

5.4 Objective 4: Promote inter-agency and cross-sectoral collaboration and partnerships

Recognizing the multidimensional nature of EID, involving different health domains and socio-economic dimensions, a wide range of stakeholders is needed and strategic collaboration and partnerships must be promoted across various disciplines, sectors, departments, ministries, institutions, and organizations at country, regional and international levels.

In most countries, sector-specific institutions have clear roles and responsibilities and budgets. But the mechanisms for cross-sectoral collaboration are not clearly identified; it is often considered to be difficult even when the need is identified, such as was the case of HPAI outbreaks in many countries. For the OWOH approach to be successful, the cross-sectoral collaborative activities for priority actions need to be better defined. Clear mechanisms and agreements will have to be developed for increased collaboration and interaction at all levels, without the need to integrate or fuse their roles (recognizing the importance of the mandates of the various institutions and agencies involved). This has been possible in emergency situations, as was demonstrated in many countries during the HPAI crisis; however, this could be a major challenge when there are no disease emergencies.

Internationally, this collaboration will occur among different agencies and organizations such as WHO, FAO, UNICEF, OIE, WWF, WCS, IUCN and advanced research organizations and laboratories, including those of the Consultative Group on International Agriculture Research (CGIAR) system. Regionally, this would include different organizations such as ASEAN, APEC, SAARC, and AU-IBAR, among others. Increasingly, regional organizations are playing key roles in managing diseases with transboundary potential. For example, APEC, ASEAN, ASEAN+3 and SAARC have recently been engaged in preparing contingency plans and promoting the establishment of regional networks on diagnosis, surveillance and socio-economic issues. Under the umbrella of GF-TADs, ASEAN, SAARC, and AU are now engaged in consolidating regional capacity with establishment of regional animal health centres to address EID. The MZCP has been fostering inter-agency and cross-sectoral collaboration and partnerships at the country and regional levels through capacity building. Institutional issues are further discussed in Chapter 7.

At the same time, international organizations have set up regional structures that enhance collaboration with regional organizations. The WHO Western Pacific Regional Office (WHO/WPRO) and Southeast Asia Regional Office (WHO/SEARO) provide regional leadership in response to a wide-ranging public health issues, including surveillance and disease information. Both regional offices have well-developed strategies for avian influenza as well as EID. The WHO AMRO/PAHO has a long-standing political process involving two annual meetings of RIMSAs. A good example of regional cooperation between different agencies is the collaboration between ALive and GF-TADs to implement the ongoing INAP on AHI in Sub-Saharan Africa. INAP is jointly developed by inputs from FAO, OIE, AU-IBAR and WHO/AFRO experts and is supported by guidelines developed by ALive (ALive, 2007).

In addition, public-private alliance and partnerships with NGOs can help to provide long-term sustainability of EID control. The major outputs will be:

- a. Strengthened ongoing inter-agency and inter-institutional collaboration at the international level through GLEWS, ECTAD, CMC-AH, OFFLU, the Global Outbreak Alert and Response Network (GOARN), INFOSAN, MZCP and other reference laboratories and collaborating centres
- b. Expanded international partnerships with wildlife, conservation, and ecology and environment groups such as WCS, WWF, IUCN and NGOs in risk assessment and management of infectious diseases

- c. Strengthened networks of Advanced Research Institutions (ARI) for the analysis of risk and support for strategic research in epidemiology and generation of diagnostics and vaccines; these networks are to include the US Centers for Disease Control and Prevention (CDC), USDA, the European Centre for Disease Prevention and Control (ECDC), the European Food Safety Authority (EFSA), Australian Biosecurity Cooperative Research Centre for EID (AB-CRC) and a number of universities and CGIAR Centers.
- d. Established regional centres for supporting and coordinating regional networks on diagnosis, surveillance and socio-economic issues
- e. Harmonized strategies and approaches for EID across countries in regions with similar problems and challenges
- f. Mechanisms for regular information-sharing and collaboration across sectors established at national, regional and international levels, for which WAHIS and INFOSAN are good examples, linking national food, veterinary and public health authorities at national and global levels
- g. Regional and country strategies that incorporate the OWOH approach to gain support from various stakeholders, including farmers, the private sector and civil society
- h. Information and policy recommendations on the OWOH approach disseminated from studies that define risk factors contributing to the emergence and spread of infectious diseases, and target sound interventions
- i. Enhanced private-public partnerships through the clear definition of private and public interests and national-versus-international public goods, and actions prioritized on the basis of a broad institutional and developmental context rather than just on technical considerations; the Global Alliance for Livestock Veterinary Medicines (GALVmed), the European Technology Platform for Global Animal Health (ETPGAH) and the International Federation for Animal Health (IFAH) will be some of the partners in this context
- j. Communications strategy to mobilize greater support for the OWOH approach, including the importance of a broader livelihoods agenda and sustainable agriculture and rural development and natural resource management
- k. A global level, inter-agency, multidisciplinary, technical advisory/support group to provide guidance and oversight on communication issues and strategies.

5.5 Objective 5: Control HPAI and other existing and potentially re-emerging infectious diseases

There are a number of infectious diseases, both zoonotic and non-zoonotic, in many developing countries where the conditions are favourable for their maintenance and spread. These diseases are often entrenched in such countries and continue to present a threat to neighbouring countries and regions, with potentially serious socio-economic impacts. One such disease is H5N1 HPAI, which continues to be a priority in countries where it is entrenched.

Diseases such as RVF, tuberculosis (TB), brucellosis, rabies, food and water-borne infections, FMD, ASF, contagious bovine pleuropneumonia (CBPP) and *peste des petits ruminants* (PPR) require significant investment in order to prevent their further spread and reduce their negative impacts. Controlling these diseases requires specific tools, methods and customization of strategies, depending on the epidemiology, the target population and the countries and/or regions where they occur. For example, new or improved vaccines are urgently needed for RVF in animals and humans, as they are for FMD or ASF in livestock. For example, field testing of promising technologies for diseases that cripple people's livelihoods merit international investment. The main outputs of this objective would be:

- a. Reduction the in number of provinces, districts and countries with entrenched infectious diseases (e.g. HPAI in Bangladesh, China, Egypt, Indonesia, Pakistan and Viet Nam)
- b. Reduced incidence and prevalence of a number of infectious diseases with significant improvement of the health of poor communities and their livestock
- c. Increased participation and capacity of poor communities and smallholder farmers in strategic surveillance of not only the diseases of immediate concern but also those that might emerge in the future
- d. Increased food safety and food security from livestock products
- e. Better understanding of the needs of the poor and of the socio-economic impacts of common diseases on poor communities
- f. Enhanced communication capacity to support control strategies.

5.6 Objective 6: Conduct strategic research

There are a large number of important issues that need attention along the research-to-delivery continuum in addressing the problem of EID. These include improved understanding of the drivers and sources of emergence, factors for spread, reasons for persistence and pathogen ecology. Epidemiological studies linked to socio-economic and policy research are necessary to improve and rationalize delivery of technical options. Similarly, specific communications challenges and the complexities of institutions within various sectors need to be better understood. Research is also needed to characterize multitude of pathogens in different farming systems and at the interface of animal-human-ecosystems health domains. Improved generic tools are also needed to rapidly develop diagnostic tests and vaccines (see Annex 5 for indicative research topics). Strategic research as outlined above would be commissioned and conducted with appropriate partners. The key outputs will be:

- a. A global scientific research and development agenda prepared and reviewed on priority EID with key partners, including international agencies and ARI
- b. Improved protocols, procedures and tools for carrying out surveillance and in-depth analysis of EID outbreaks
- c. Improved understanding of infection and transmission dynamics, ecology, and other drivers of EID spread
- d. New generic tools for diagnosis, outbreak prevention, control and containment, including vaccines and therapeutics

- e. Improved understanding of impacts and benefit–cost ratios of various interventions from surveillance, capacity building and disease control options
- f. More effective communication strategies and methods (including the use of new media) through ongoing analysis of existing strategies.

6 Cross-cutting issues to be addressed

Applying OWOH principles to mobilize broad cross-sectoral collaboration will require the identification of crosscutting and common issues among the three health domains. Key crosscutting issues at the technical, policy and institutional levels are as follows:

6.1 Surveillance and disease intelligence at the three health domains

For each of the health domains, diseases can emerge from the introduction of pathogens from sources within each system or through cross-species jumping of pathogens across domains. Thus, each sector has a major incentive to prevent the incursion of disease into its specific domain. Collaborative and well-structured targeted surveillance in specific risk areas can be envisaged, such as in shared ecosystems between domestic and wild animals, newly encroached forest areas and wetlands, trade in wildlife and bush meat, wet markets, and animal and human movement across countries and regions.

The analysis of H5N1 spread has highlighted the importance of market networks and trade (legal and illegal) in the spread of the disease. A number of sub-sectors and stakeholders are often involved and interconnected, and all of these will have to be engaged in order to prevent the emergence and spread of infectious diseases.

For the broad cross-sectoral collaborative effort to be successful, primary capacity in disease surveillance in all three domains needs to be built in all countries. Cross-sectoral collaboration may be facilitated and enhanced if common and harmonized outbreak investigation and reporting approaches are developed at the grassroots level, from the district public and veterinary health officer to extension workers. Grassroots-level disease surveillance can be quite difficult in countries with poor veterinary extension and human public health services. Thus, participatory approaches should be employed, supported by appropriate training.

6.2 The need to improve biosecurity

Biosecurity needs to be addressed to control the emergence and spread of infectious diseases. Levels of biosecurity vary depending on the economic and health conditions of communities and the types of farming systems practised.

Smallholder farming system

Most poor communities and smallholder farming systems lack the resources to access public and veterinary health services. Poor sanitary conditions and deficient management practices in these systems result in the entrenchment of various infectious agents. Therefore, long-term efforts are needed to improve biosecurity while simultaneously enhancing surveillance in these systems. However, considerable care needs to be taken in improving biosecurity in poor and smallholder farming communities because of cultural and traditional barriers and their vulnerability to

change. Further, the costs of establishing greater biosecurity may be prohibitive. Smallholders and backyard farmers and those living close to wildlife are often particularly hard to reach out to, especially rural women and children. In contrast, there is significant scope to improve biosecurity in small- and medium-sized commercial farming sectors because of the availability of resources and the expectation of direct benefits.

Industrial farming system

Improving biosecurity in industrial farms can be achieved rapidly due to their ability to enforce appropriate measures regarding inputs, outputs and infrastructure; industrial farms are able to support the training and follow-up of animal workers and employees.

Ultimately, biosecurity throughout the food chain is intimately related to perceptions of food safety and health risks by a range of consumers. In many countries, live-animal markets provide an assurance to poorer buyers of the quality of meat products, and by culture and tradition or taste, are similarly appreciated by middle-class urban populations. In the context of this Strategic Framework, biosecurity issues need to be addressed (taking local culture and tradition into account) in the broader context of food safety along the food market chains.

6.3 Bioterrorism

A number of infectious agents can be used deliberately to cause harm to the global community. Understanding the characteristics of such potential in the context of their impact, their biology and the availability of tools is important. The global surveillance and prevention activities envisaged for this Framework will also benefit the common fight against bioterrorism (or agroterrorism) as a global public good because surveillance mechanisms are directed against all potential emerging diseases, without prior intelligence on the category of disease to be detected or on natural versus intentional introduction of diseases.

6.4 Mechanisms to address socio-economic disincentives

Experience with controlling HPAI has shown that ensuring farmer cooperation in reporting disease events requires appropriate incentives. Not getting these ‘incentives’ right has, in many cases, led to the consumption, hiding and selling of potentially diseased birds. The concept of establishing attractive incentives could be extended across the broader field of disease management to change behaviour in relation to farm biosecurity and disease reporting, through financially realistic opportunities for farm upgrading or alternative livelihoods. Different farmers may respond to different incentives for behaviour change. Even autonomous local governments, often responsible for funding local health services, can have different incentives and priorities than their national governments. Incentives for local preparation and response to diseases of national concern need to be explored. A tailored and targeted communication strategy to advance these incentives is required through various participatory approaches.

6.5 The need to address broader developmental issues

Many of the factors related to disease emergence, re-emergence and spread—such as expanding livestock production, mixing of livestock species, encroachment by settlers

into wild forest areas, and peri-urban livestock keeping—are intimately linked to livelihoods, often of very poor people. While rural communities aspire to improve the health of their families and their animals, they may have little or no access to human or animal health services. Women, who are often key small livestock keepers, are particularly marginalized from support services. Poor people are also confronted with common human and animal disease problems, which for them represent a priority over potential pandemic risks. Therefore, it is necessary that global EID surveillance efforts become embedded in the broader health management approach in developing countries at the community level, with recognition of the associated livelihood agendas. This entails a bottom-up approach, which recognizes the needs of those most directly concerned and which emphasizes community involvement, ensuring the participation of women, with supportive disease management and communication programmes playing a key role.

6.6 Communication strategies at different levels

The Strategic Framework gives primacy to the prevention of disease emergence and spread through dialogue, participation and community ‘ownership’ of interventions. Two-way communication is essential to ensure that not only is the local public informed about new health threats but that information and practices at the community level influence national and international disease response strategies. Specifically, the following communication strategies will be required to promote preventive behaviours at the community and household levels:

- **Civic engagement:** Outreach efforts across national and sub-national levels will be important to enable the participation of the public and the community (men, women, boys and girls) in planning, prioritizing and decision-making, to be vigilant and to respond to new and emerging health issues, including pandemic threats.
- **Community preparedness:** Using participatory approaches, community members should be involved in identifying any new health threats confronting the community. Specific actions to be promoted are improved biosecurity measures, community-based surveillance of new and emerging diseases, and timely and responsive reporting.
- **Community and social mobilization:** Preventive practices for new diseases will be introduced, building upon existing social and community networks that are already engaged around public and animal health issues.
- **National public education campaigns:** Promoting the larger public good and the need to be vigilant and pro-active around new and emerging health threats will create a culture of prevention among different constituent groups.

6.7 Private-public partnership

Effective long-term public-private partnership (PPP) is necessary for the success and sustainability of the Framework. This would involve a strong coalition of specialized international agencies, donors and various government ministries with the key private sector players, in global health issues and across food supply sub-sectors, at international, regional and country levels. The key private-sector stakeholders in this partnership are likely to be the field-level extension workers (for animal and human health), field clinics, farmer cooperatives, input suppliers at the village level to larger

feed producers, drug and pharmaceutical companies, and traders in livestock and wildlife.

The PPP supports capacity building and strengthens leadership capabilities. For example, the ‘Surveillance Tripod’ (OIE and FAO, 2007) for strengthening surveillance of diseases at grassroots level involves official services—veterinary primarily, but also human outreach health—to work together with practitioners (local health and veterinary services) and communities and farmers. Similarly, in strengthening surveillance networks in the framework of PPP, farmers, livestock owners, official veterinarians and private practitioners are trained. Since many of these players have their own priorities, the challenge for this Strategic Framework would be to identify specific incentives for different (often financially more powerful) private sector players and ways that they can contribute to the overall health systems without excluding or compromising the needs of the poorer sectors of the community.

Coalitions of companies, researchers and international agencies have begun to explore common areas of long-term interests at the international level, such as the Safe Supply of Affordable Food Everywhere (SSAFE) initiative and affordable veterinary products (GALVmed). More groupings like these need to be created at the national and local levels.

6.8 Monitoring and evaluation

The implementation of this Strategic Framework will be a complex task, given the involvement of a large number of partners, wide geographical coverage and multidisciplinary approach. Thus, a common monitoring and evaluation framework will need to be developed by the specialized international agencies and financial institutions to closely monitor the evolution of the approach and make adjustments to the Framework as appropriate.

7 Institutional issues

Within a country, the issue of EID at the animal–human–ecosystems interface usually involves more than one sector or institution. In addition, the complex interactions of biological, ecological, environmental and socio-economic factors that act at the animal–human–ecosystems interface require multidisciplinary and multisectoral approaches. This approach underlines the OWOH concept and promotes collaboration among a wide range of stakeholders and institutions, including public and animal health sectors, medical and veterinary communities, wildlife and environmental organizations, the private sector and advanced research institutions at the country, regional and international levels. Successful adoption of the approach would have the advantage of including:

- Pooling—and thus more efficient use of—expertise and financial resources to address a common problem across the three health systems
- Synergy of different institutional perspectives and experiences
- A strong focus on constructive partnerships.

This increased collaboration will also lead to a better understanding of the epidemiology of EID, faster identification of reservoirs, improved public and animal

health practices, and more efficient control and prevention, particularly in resource-poor countries.

The cross-sectoral collaboration among the international agencies in the area of disease control has improved significantly in the past few years. Regional multisectoral organizations are increasingly engaged in promoting efforts to respond to EID threats, and they have endorsed the GF-TADs model for establishing appropriate structures and mechanisms for infectious disease control. It is important to build on these successes and promote the establishment of a flexible network of key international institutions that draws on their unique mandates and complementary expert-base. As outlined in section 4.9, this network must have the flexibility to adapt, form new coalitions and respond rapidly to any new health emergencies.

7.1 Guiding principles and characteristics of a successful network

In order to achieve the overall goal of the Strategic Framework—consolidating current efforts to control EID and enhancing collaboration at the international, regional, and country levels (section 4.2)—three overarching principles should guide the design and functioning of animal–human–ecosystem health networks at all levels:

- **Coordinated multisectoral action** that brings together those working on human, animal and ecosystems health is needed to address the impact of diseases occurring at the animal–human–ecosystems interface.
- **Engagement of key international institutions**, drawing on their unique mandates and complementary expert base, and permitting rapid engagement of a broader range of stakeholders, in order to respond effectively to a variety of disease threats.
- **Initiation and implementation at the country level**, with stronger intersectoral collaboration and political commitment.

While maintaining flexibility, evolving institutional mechanisms must be able to sustainably ensure coordination of effective early warning systems, mobilize rapid response to EID and reduce long-term risks. There should be transparent mechanisms and agreements between and within global and regional institutions and national authorities.

Taking into account these principles and the experiences of the ongoing HPAI campaign—in particular the findings of several independent evaluations by FAO and the World Bank (see Annex 6)—a sustainable institutional framework for early detection and efficient containment of EID at the animal–human–ecosystems interface must have the following characteristics:

At the country level

- An institutional framework that enables cooperation between the different stakeholders—including representatives of human, animal and ecosystems health agencies—and of the public and private sectors in the early detection and response to EID at the animal–human–ecosystems interface
- Strengthened sustainable surveillance systems that have direct communication channels between the field and public and animal health authorities and that

allow prompt response to prevent domestic and international spread, as well as appropriate communication to the public at the international level

- The development of capacity to detect, assess, notify and report disease events in humans and animals in accordance with IHR and OIE standards
- Budgetary provisions that support surveillance and response systems
- Legal systems that allow a multisectoral approach to EID control.

At the regional level

- An appropriate framework for ensuring coordinated surveillance and emergency disease planning that can efficiently establish a shared strategy and the joint use of diagnostic and rapid response resources and facilities
- A commonly agreed regional policy framework and supporting country-level legislation for the monitoring and management of cross-border movement of humans, animals and animal products

At the international level

- Adequate scientific and logistics capacity in human, animal and ecosystems health to quickly predict, detect and identify EID
- An institutional framework that can unite stakeholders to create a mutually agreed response strategy, with assigned responsibilities for implementation
- Adequate capacity and authority to rapidly support countries in times of outbreak, in particular in the containment of an EID emergency
- An assured source of funding, brought together by the global community in recognition of the global public goods characteristic of EID and preferably governed by a set of fiduciary standards that allow fast but financially correct disbursement.

7.2 Institutional coordination and collaboration

An approach to diseases at the animal–human–ecosystems interface calls for new working relations among existing institutions. Each institution should review its own working methods in order to better contribute to evolving partnerships by: a) strengthening collaboration among existing institutions, and b) improving the effectiveness collaboration so that each partner can make any necessary adjustments. The precise mechanism for both a) and b) needs further discussion.

At the country level, much effort and investment is needed to develop meaningful and productive institutional partnerships among the traditional public, animal and wildlife health sectors, and also among social and public financing sectors; these partnerships would include government departments, industry, the private sector, research institutions and civil society organizations. At the regional level, they include organizations that promote collaboration among governments. Internationally, they include both the international organizations and a wide network of actors.

At the country level

Within the public sector, which has the primary responsibility for prevention and control of diseases with epidemic and (perhaps) pandemic potential, it is important that the organizational gains made in managing HPAI are not lost, but rather

consolidated in a manner that facilitates the fight against EID. Drawing from the experiences of HPAI reveals several options for strengthening partnerships among public sector actors; we present some of these for consideration below. However, it should be borne in mind that the preferred option will depend on, among other things, a country's stage of development and its economic and physical geography. National authorities will decide on which institutional arrangements to pursue:

1. **A continuation of existing frameworks** might not be sustainable because current levels of cooperation between health and agriculture ministries would gradually fade out. Even in countries with highly effective response systems for HPAI, prolonged periods without outbreaks result in a loss of vigilance. Institutionalizing coordination is unlikely to be sufficient without sustained dialogue between human and animal health authorities, especially when there is no crisis to galvanize cooperation. It seems likely that national authorities will choose a different option.
2. **Creation of permanent coordination mechanisms** for contingency planning and action can be achieved through a regulatory instrument (law) or less formal mechanisms such as a memorandum of agreement. Set-ups can be adapted to varying needs during an outbreak or inter-epidemic or inter-pandemic periods.
3. **The establishment of a permanent inter-departmental task force** which would be responsible for overseeing disease surveillance and reporting, updating contingency planning, and first response during an outbreak. National authorities may find the emphasis on joint responsibility for disease surveillance to be particularly attractive because a) it exemplifies the structured cross-sectoral collaboration that OWOH aims to promote and b) it formalizes that collaboration and defines fixed roles and responsibilities for each sector that will help avoid loss of vigilance.
4. **The establishment of 'OWOH teams'** comprising human and animal health zoologists, ecologists, as well as other professionals, would be charged with joint surveillance and disease response as and when needed, and if appropriate. However, such a change would be difficult to justify in many countries that are already constrained in their ability to provide basic human and animal health services.

Specific actions to enhance the collaboration between the public health, animal health and wildlife institutions at the national level would include:

- a. Allocating appropriate priorities and resources for the control of infectious diseases at the animal–human–ecosystems interface
- b. Strengthening expertise in wildlife biology in the veterinary services
- c. Harmonizing disease-reporting capacities and procedures, and channels between human and animal health services
- d. Phasing out constraints to formal and informal collaboration among the key partners in human, animal and ecosystems health
- e. Adapting medical and veterinary curricula to strengthen initial and continuing training of officials for human and animal health services, including appropriate ecosystems health studies

At the international level

Two options are proposed for an international institutional framework that addresses EID at the animal–human–ecosystems interface:

Option 1: Specialized international agencies retain existing institutional responsibilities, but with strengthened capacities in a number of key areas:

- Surveillance systems, including a strengthening of international wildlife/ecosystems health capacity
- Information and disease intelligence systems (e.g. GLEWS)
- Country incentives for early disease reporting and notification, in particular in animal diseases under the relevant OIE standards
- The rapid response capacity in the international agencies (WHO, FAO, OIE and UNICEF), including the response capacity at WHO under the IHR
- The contribution of the private sector (see Chapter 8)
- Improved administrative efficiency between the international financial institutions (IFIs) and the specialized international agencies, and between the IFIs and countries.

This option would build on existing arrangements and would likely address some of the constraints that were experienced in the early phase of the current HPAI campaign. However, it does not fully address the broader issues of maintaining visibility and communication among many stakeholders.

Option 2: In addition to Option 1, the specialized international agencies would gain a strengthened coordination mechanism and enhanced country focus.

In this option, a standing coordination mechanism would be created to garner political support, help ensure continuity of joint operations and encourage increased responsiveness to new outbreaks. Two possibilities are:

- Governments establish a forum or partnership that will focus on implementation of the Strategic Framework from a political perspective and provide advice and guidance to the specialized international agencies
- Formal collaboration between the specialized agencies and engagement with other stakeholders is strengthened through joint agreements and coordination mechanisms (e.g. GLEWS, OFFLU and GF-TADS) to encourage collaboration with more stakeholders and strengthen a country focus.

The technical agencies (WHO, FAO, OIE and UNICEF) have endorsed Option 2, as they feel that this would ensure both strong political and technical support to implement the Strategic Framework, and enhanced preparedness against EID at the animal–human–ecosystems interface. However, a more permanent mechanism might still be needed to ensure continued preparedness and sustain political interest.

Specific areas that need more attention to enhance cooperation between the different agencies include:

- a. Closer cooperation between wildlife and natural resource management agencies and the specialized international agencies concerned with EID
- b. Enhanced research capacity to identify trends and assess the risks of EID

- c. Strengthened global communication capacity
- d. Development of early response teams in international agencies, in addition to national and regional response teams
- e. Strengthening of the global legal framework for reporting animal diseases
- f. A clearer distribution of responsibilities between the different agencies.

Implementing these preparatory steps will involve some transaction costs. However, they will be much less than the extra costs associated with organizing responses to outbreaks or emerging diseases if preparatory steps have not been implemented.

8 Financing the framework

8.1 Shifting the paradigm: Broadening the avian and pandemic influenza response

The overarching objective of this Strategic Framework is to diminish the threat and minimize the global and multiple impacts of infectious diseases at the animal–human–ecosystem interface, including those with epidemic and pandemic potential (section 4.1). The Framework represents a logical continuation and expansion of the successful current global response to AHI. As such, it is firmly underpinned by a flexible financing approach that ensures the ongoing provision of the majority of funding without overlap or duplication and in support of clearly articulated national priorities. Countries affected by AHI are at the heart of the current response, which is being extended to address potential threats from EID. The Framework draws on the experience gained from AHI, while acknowledging the need for long-term systemic investment in infrastructure, human resources and institutional capacity.

As described in section 2.3, the response to AHI was unprecedented in many respects. Whereas response to other disease threats had been structured vertically and had concentrated on human and financial resources to the exclusion of broader issues, the AHI response was explicitly premised on the principles of sustained collaboration across sectoral and institutional boundaries. In the process, the inadequate and severely under-funded state of public and veterinary health systems in many developing countries was brought to the fore. It was also recognized that disease prevention and control efforts cannot be sustainable unless articulated within an overall system encompassing veterinary and public health services.

This Strategic Framework takes a pragmatic view to sustaining cross-sectoral collaboration. It also strongly supports compliance with regional and international norms and aims to assist countries in fulfilling the commitments they have made under the IHR and OIE standards. In this context, disease prevention increases in importance with respect to crisis response, with countries positioned at the forefront. As well, the need to increase aid effectiveness and to enable multiple donors to coordinate the use of their resources is at the centre of the paradigm shift.

8.2 Global public goods and international commitment

8.2.1 Global and national public goods

As defined in section 4.7, public goods are non-rival in consumption and have non-excludable benefits; hence the market cannot price them efficiently and will not supply them in adequate amounts. This justifies other mechanisms of collective action. The implication is that global public goods, which benefit all countries, may require the intervention of global institutions such as the United Nations and the World Bank. However, determining specific responsibilities needs further definition.

The International Task Force on Global Public Goods defined global public goods as:

"Issues that are broadly conceived as important to the international community, that for the most part cannot or will not be adequately addressed by individual countries acting alone and that are defined through a broad international consensus or a legitimate process of decision-making."

(International Task Force on Global Public Goods, 2006, p. 13)

The task force also defined various categories of public goods (see Box 8.1).

Box 8.1. Definitions of public goods

Local public goods benefit all members of a local community (possibly including citizens of more than one country).

Domestic public goods benefit all members of a community situated within a single state. National public goods are domestic public goods, but domestic public goods need not be national.

National public goods benefit all citizens of a state.

Regional public goods benefit countries belonging to a geographic territory.

International public goods benefit more than one country. Global and regional public goods are both international public goods, but an international public good may be neither regional nor global, instead benefiting an association of countries.

Source: (International Task Force on Global Public Goods, 2006, p. 14)

The International Task Force, the World Bank and the United Nations recognize the prevention of the spread of infectious diseases as a global public good. Beyond this general notion, nuances pertaining to biological characteristics of diseases, global and national institutional frameworks and the large variability of public health infrastructure add levels of complexity that may introduce ambiguities to decision-making on financing mechanisms. Most public goods, including global, are impure: there are various degrees of exclusion or rivalry when the actual components of the good are further defined.

In the context of this Framework, the prevention and control of disease at the animal–human–ecosystems interface becomes a global public good if the disease: a) is highly infectious, b) has a strong impact on human well-being and c) has strong transboundary characteristics. Based on these criteria, Table 8.1 provides a guide to classify various activities according to their global, regional or national dimension.

Table 8.1. Activities for prevention and control of diseases at the animal–human–ecosystems interface and their status as a public good

Activity	Disease of low human epidemic potential	Disease of moderate to high human epidemic potential
1. Preparedness		
Risk analysis	Global	Global
Preparedness plan	National/regional	Global
Animal vaccine development	Private ¹²	Global
2. Surveillance		
Public health, veterinary and wildlife	National	Global
Diagnostic capacity	National/global	Global
Managerial and policy arrangements	National/global	Global
3. Outbreak control		
Rapid response teams	National	National/global
Vaccination	National/regional	Regional/global
Cooperation among human, veterinary and wildlife services	National	Global
Compensation schemes	National	Global
4. Eradication plans	National/regional	Global
5. Research	National/regional	Global

Distinguishing between public and private goods or determining if a given activity or its effects can be localized only in one country is difficult. In operationalizing infectious disease prevention as a global public good, the Strategic Framework uses as a starting point the IHR and OIE standards on animal diseases, which are designed to prevent global public health threats to humans.

Two problems can arise in the determination of global public goods: 1) the ‘weakest link’, a situation in which countries with poor surveillance capacity and no resources to improve their situation can jeopardize global efforts, and 2) the ‘free rider’, which arises when a country benefits from the information and goods provided by others but does not wish to reciprocate. These issues, coupled with the need to ensure compliance at the country level, highlight the complementarity between national and global action in the provision of public goods, which adds further complexity to the task of international intervention in this context.

8.2.2 Funding obligations and international commitment

Balancing international and national funding. As indicated above, external and national funding resources to control and prevent endemic and (re-)emerging diseases at the animal–human–ecosystems interface should be seen as complementary. Most activities related to the control of such diseases as well as potential zoonotic pandemics are global public goods, as shown in Table 8.1. While ideally these activities should be funded by the countries themselves, experience over the last decades has shown that this is not sustainable for low-income countries. Therefore, the Framework recommends a more pragmatic approach, which acknowledges that in the case of low-income countries, activities with dominant global public good characteristics should be funded as grants by the international community. However, a recent OIE-World Bank feasibility study, ‘Global Response to Emerging Diseases’ (Agra CEAS Consulting, 2008; Civic Consulting, 2008), recommends that only those

¹² This may also be a global public good depending on diseases and circumstances (context)

countries that have prepared a PVS study, an emergency plan and a compensation framework be eligible for international grant funding; public health aspects of these eligibility criteria must be included and more detailed discussion is needed. Higher-income countries would be expected to fund all activities with their own resources, or initially with loans and credits from international sources.

For all countries, national funding should complement international funding for the national component of the control of the highly infectious diseases (including zoonoses) and for the prevention and control of other less infectious diseases. Support is essential to gain the trust and cooperation of local populations.

Obligation of national authorities. Government authorities are obliged to contribute to the control of infectious diseases, and this is reflected in the IHR and OIE standards. Under these regulations, all Member States of WHO and OIE are bound to participate in global efforts to contain animal and public health risks of international concern, including working towards full implementation of IHR by 2012 and strengthening their national veterinary services (despite the current lack of funding for IHR and veterinary services at the international, and most national, levels).

International solidarity. Countries differ in their capacity to fund this international commitment. Thus, in addition to financing their own systems, high-income countries could contribute towards increasing the capacity of low-income countries. Middle-income countries can generally increase fiscal space themselves, be supported by loans or credits from IFIs or contributions from their private sectors. Most of the international grant financing should therefore be directed to low-income countries, in particular those that are considered hotspots. These recommendations underpin the proposed funding mechanism in the following sections.

8.3 Responding to the AHI threat: An unfinished agenda

8.3.1 A flexible, adaptable framework for fighting AHI

In Beijing in January 2006, partners agreed on a financing framework to support a set of identified priority funding needs at the international, regional and country levels (World Bank, 2006). The adopted framework was designed to be flexible enough to address needs as they emerged and to adapt over the long term.

Since then, donors have reported commitments of US\$2.0 billion (against a pledged total of US\$2.7 billion). Of this amount, US\$853 million is in support of country programs, while US\$510 million was channelled to international organizations, US\$301 million to regional programs, and US\$386 million to other recipients (including research).

8.3.2 Achieving HPAI control

Closing the current financial gap to fight AHI. Of the total US\$2.2 billion needed for country-level programs in 2006–2008, there was a shortfall of over US\$800 million (Table 8.2). More than half of the gap was associated with programs in Sub-Saharan Africa, while countries in the Middle East, North Africa, East Asia and the Pacific also experienced significant shortfalls.

Table 8.2. Financing gaps in avian and human influenza country-level programmes (US\$ million)

Region	Needs (2006–2008)	Available financing ^a	Remaining gap
Sub-Saharan Africa	589	149	440
East Asia and Pacific	935	656	279
Europe and Central Asia	247	228	19
Latin America and Caribbean	17	17	0
Middle East and North Africa	233	150	83
South Asia	149	134	15
All regions	2,170	1,334	836

a/ Reports by donors of commitments to country programs as of April 30, 2008.

Unmet needs in the Africa Region. The amount of approximately US\$590 million needed to control AHI in Africa is based on estimates made in preparation for the Bamako Conference held in December 2006. For that event, the ALive partnership established a multi-institutional task force (AU-IBAR, FAO, OIE, WHO and UNICEF) to identify financial needs and gaps and to determine the necessary funding to boost the operational and technical capacity for HPAI prevention and control, human influenza pandemic preparedness and harmonization of communications strategies in Africa.

Extending the program in time. There has been an overall reduction in HPAI outbreaks, yet the risk of a worldwide influenza pandemic remains. To sustain current efforts to address this risk, the international community should continue its support of ongoing initiatives to control AHI for three more years, by which time the HPAI could be managed routinely.

At the country level. Estimates are calculated based on the methodology outlined in Beijing and on the findings of the INAPs undertaken in numerous countries. A recent country survey revealed that 140 countries have INAPs in place. In the Africa Region for instance, the ALive Partnership supported rapid assessments, which were instrumental in generating the INAPs. The 11 INAPs that have been completed to date indicate an average budget requirement of US\$13 million per country to address immediate and medium-term (0–3 years) needs. Although not all regions were adequately funded, available resources were more closely matched to needs than in Africa. Consequently, those regions are much further down the road with investments to combat the threat of HPAI, and because of the longer term approach adopted, to other diseases we well.

At the regional and international levels. The continued fight against HPAI, and the expansion to address other EID requires an intensification of collaboration among the many regional and international organizations in coordinating complex global tasks, such as data collection and analysis for the human, animal and wildlife health sectors (e.g. as begun with GLEWS) and coordination of expertise at all levels for the control of outbreaks and the reduction of endemic transmission.

Table 8.3 provides a summary of annual country-level needs by region, as well as the total funds needed by the international agencies for supporting regional and global functions.

Table 8.3. Estimated annual external financing needs to achieve HPAI control (US\$/year)

Recipient countries and agencies	Additional financing needs (US\$ million/year)
Country level	
Countries in Africa (excluding North Africa)	204
Countries in East Asia and Pacific	74–135
Countries in Europe and Central Asia	11–17
Countries in Latin America and Caribbean	2–3
Countries in Middle East and North Africa	23–38
Countries in South Asia	28–38
Regional and global levels	
International agencies	200–300
Annual funding needs over next 3 years	542–735

8.4 Capacity building for prevention: A results-based approach Inter-epidemic and inter-pandemic periods

An incremental approach to financing

The strategies developed by the leading international technical agencies (FAO, OIE, WHO and UNICEF) in the face of this evolving crisis continue to guide and inform almost every technical aspect of the global response to HPAI. Moreover, the technical assistance and support they provide to many countries is highly valued. Demands on their limited resources will increase under this expanded Strategic Framework. Consequently, a results-based approach is proposed to enhance effectiveness at the country level. Global and regional initiatives are expected to support country actions, provide avenues for inter-country collaboration and support areas where no single country can be effective on its own.

Results-based financing encompasses several mechanisms designed to enhance performance through incentive-based payments, which shift the emphasis from financing via inputs to financing through achievement of outputs. Consequently, monitoring and evaluation and planned impact assessment are integral parts of implementation.

8.4.1 Toward OWOH

Implementation of this Framework envisages a shift from the primary focus on HPAI to (re-)emerging zoonotic diseases at the animal–human–ecosystems interface with significant pandemic potential. The paucity of data and the substantial degree of uncertainty regarding the origin and scope of such diseases, as well as the and scale of response needed, require that this Strategic Framework be highly flexible. Hence, robust assumptions were used to develop the estimates, which should be regarded as indicative only. Implementation of the Framework should therefore be carefully monitored to facilitate adjustments and to redirect resources to address areas of greatest need. Estimating the needs more accurately will be greatly assisted by the use of existing diagnostic tools such as the OIE-PVS and IHR gap analysis. The OIE has

also started, in collaboration with FAO and donors, several national gap analysis diagnoses based on PVS outputs and, once finalized, will help to estimate the cost of improving the respective national veterinary services to international standard. Other tools to assess essential public health functions have also been used in many countries, and these experiences have informed the following cost estimates. However, much less is known about how to estimate the cost of addressing ecosystems health dimensions, particularly wildlife-related aspects.

8.4.2 Tailoring systems: Risk, budget and timeframe

As mentioned previously, producing an estimate of the global financing needs to implement this Strategic Framework is an art, not a science. Calculations of the resources needed to strengthen global capacity to respond to disease threats are complex. The resources needed are inversely related to the level of risk deemed acceptable by the global community; the lower the level of acceptable risk, the higher the level of financial resources required. The estimates put forward in this analysis should therefore be seen as a starting point for the collective negotiations that must take place concerning the trade-off between risk and cost.

Time is another consideration, as meeting the financial needs identified in this analysis would not necessarily address all of the long-term challenges to capacity development that exist in many countries. For example, although human resources for veterinary and public health are urgently needed, this represents a long-term proposition and is conditional on national and international labour markets. Global resource pools with relevant experience in these areas are quite limited, a fact that constrains the implementation of the current HPAI program. Also, technical analytical support well beyond that provided by ministries of health and agriculture is needed.

Some countries have limited absorptive capacity for funding to maintain and sustain investments over the long term. Even in the midst of the AHI emergency response, many developing countries have found it difficult to fully utilize the assistance they have received. Moreover, many low-income countries were constrained by the lack of counterpart financing and recurrent budgets, which were often overlooked. Lack of procurement capacity and the highly technical nature of many of the essential investments also caused significant implementation delays. In addition, determining priorities amidst many competing needs—within and beyond human and animal health—also affect resourcing (human and financial) and therefore implementation.

8.4.3 Cost structure of the Framework

For convenience, expenditure categories have been grouped into five strategic priorities that underpin the Strategic Framework: (a) strengthening public health services; (b) strengthening veterinary services; (c) wildlife monitoring; (d) costs related to technical assistance from international organizations and participation in regional and global initiatives; and (e) research. These areas will be discussed in the context of the animal–human–ecosystems interface, with a focus on prevention. While the costs associated with control of HPAI were included in table 8.4, they were not included in the two funding scenarios that follow, as the complete uncertainty concerning what was being estimated rendered the exercise almost meaningless. It is recognized that each country will approach implementing the Framework differently depending on geographic, economic and other factors. Nonetheless, experience with HPAI confirms that a coordinated response embedded at the country level, but with complementary investments at the regional and global levels, is essential.

(a) Costs of prevention and strengthening of human and animal health services

Efforts to prevent and respond to the outbreak of HPAI have demonstrated that many countries were not sufficiently prepared for such a catastrophe. Many low- and middle-income countries had largely neglected their veterinary and public health services during the last decades, the effects of which will take time to overcome. Veterinary services are the fulcrum in the prevention, control and eradication of EID, yet to be fully effective they require strong complementary public health and wildlife services.

Key elements of effective prevention programs in both animal and public health include:

- Adequate infrastructure and expertise (including training) at the national and local levels, and in ports of entry
- Timely and responsive disease surveillance systems for animal and human populations
- Up-to-date emergency preparedness and response plans
- Capacity for communication of level of risk
- Capacity to meet international agreements and standards
- Permanent reporting and improvement of biosecurity
- Governance and legislation in line with international standards
- Adequate and sustainable laboratory capacity supported by external quality assurance systems
- Established monitoring and evaluation of veterinary and public health services
- Legal framework with incentives for cooperation with the private sector
- A communication protocol between animal and public health surveillance systems.

Not surprisingly, investments in improving veterinary services made in the response to HPAI were focused mostly on poultry; this Framework seeks to extend that effort to EID with epidemic potential. Consequently, the inclusion of other species in the monitoring program substantially increases the overall funding needs, although not in a linear way. Thus, it is important to note that the infrastructure in place for poultry offers significant opportunities to exploit economies of scale when addressing additional species, as support services for human and laboratory capacity can often be shared.

Although many low- and middle-income countries have recently improved their veterinary and public health services substantially, many will have to make large long-term investments—including infrastructure and human resource development—in order to meet the challenges envisioned in the Framework.

Monitoring: Special attention for hotspots. While all countries should have the basic infrastructure to detect diseases with epidemic potential, analysis of the predisposing factors for disease outbreaks shows that certain regions are more at risk than others. Particular attention should be paid to these hotspots and additional surveillance capabilities will be required.

The methodology for estimating the total investment needed to strengthen and sustain veterinary and public health infrastructure for surveillance is based on three steps:

1. An estimate of basic infrastructure needs
2. Costs needed to maintain adequate veterinary and public health services

3. An adjustment for investments already made.

(b) Costs associated with prevention and strengthening of wildlife monitoring

This Strategic Framework recognizes of the critical role that ecosystems play in originating new zoonotic diseases. The inclusion of wildlife poses substantial new challenges for which there is much less experience on which to draw. Under some circumstances, comprehensive wildlife monitoring could require resources that would exceed the total estimated for all other priority areas combined.

The large uncertainty surrounding this area calls for careful consideration of the risk factors and, since it is unlikely that there will be sufficient resources to undertake an intensive global strategy, a decision must be taken as to what constitutes an acceptable level of risk. Surveillance activities should strictly follow a risk-based approach, the fundamentals of which are to be developed through large-scale research activities.

Three different strategies for wildlife monitoring were defined, with different levels of surveillance intensity: (a) intensive monitoring (high cost); (b) medium-intensive monitoring (used in the cost tables); and (c) extensive monitoring.

(c) Costs related to technical assistance from international organizations and participation in regional and global initiatives

The OWOH approach envisages an intensification of collaboration among the many international organizations in coordinating the various regional and global tasks. The distribution of tasks and funds among international and regional organizations will depend on the institutional arrangements made during the implementation of the Framework. The ‘Consolidated Action Plan for Contributions of the UN System and Partners’¹³ provides insight into the present needs to fight HPAI (US\$339 million in 2008). It is assumed that this amount will decrease for HPAI but will be increased to address other diseases. Therefore, the estimate between \$200 and \$400 million per year to address regional and international needs has been included.

(d) Communication and social mobilization costs

Behaviour change communication is a critical element, both during inter-epidemic periods and in response to an outbreak or unusual circumstance that may represent a public health threat. The most successful experiences in the AHI response have underscored the importance of an integrated communication strategy within human and animal health response strategies. Adequate resources therefore must be available for long-term communication for behaviour change, social mobilization and policy advocacy, which are key pillars of the Strategic Framework.

The amount of funds spent on communication can be large, especially if mass media, which are often the most effective—and expensive—channel for widespread dissemination, are used. On the other hand, relatively small investments in building the capacity of governments to develop, implement and evaluate communication strategies are critical. For example, without undertaking baseline studies to understand current behaviours and their drivers, it will be difficult to develop appropriate strategies. Creative approaches need to be developed that enable communication strategies to support the programme goals in the most cost-effective ways. Therefore, the key for developing effective communication strategies is to build human capacity, as well as to ensure the minimum resources required for operational costs are

¹³ <http://www.undg.org/index.cfm?P=52>

available for all stages, from strategy development to ongoing monitoring and evaluation.

(e) Research costs

Investment in research and development is necessary for a fully effective Strategic Framework. Following are some questions to be addressed: Where, how many and how frequently should samples be taken for effective surveillance? What are effective strategies to combine data so that new diseases are detected in a timely and accurate manner, without the global community being overwhelmed by false positive results? In the case of newly discovered diseases, it will be crucial to quickly develop an insight into the cause, origin, and epidemic and pandemic potential of the disease so that adequate measures can be taken. See Annex 5 for a partial list of research topics to which such funding could be applied. While some contributions to research from the private sector might be expected, results are required to be in the public domain. Hence, public sector sources are needed.

To make this Strategic Framework most effective, investment in research and development is also needed (see section 5.6). An annual investment of US\$35 million is foreseen for research and development.

8.4.4 Some preliminary cost estimates

Before attempting to estimate costs, developing countries were grouped by region and by per capita income levels into low-income (LI), lower middle-income (LMI), upper middle-income (UMI) and high-income countries (HI). Costs of implementing the Strategic Framework were then estimated using two scenarios: (a) Scenario 1, which focuses on 43 low-income countries only and (b) Scenario 2, which includes all 139 eligible countries. The nature and scope of the Framework requires a long-term horizon. Consequently, the costs associated with its implementation were calculated for a 12-year period (to 2020). Current costs (2008) were used but were not adjusted for inflation in future years.

A methodology was developed for estimating costs under the five strategic priorities identified earlier. Using this methodology, cost were first estimated for Scenario 2. However, given the competing high-priority needs for development financing at the international level, it was felt that the sum required could not be easily realized in the short term. Thus, Scenario 1 was considered to target low-income countries, where the needs are comparatively greater than the other categories of countries indicated above. In deriving these estimates, 41%, 60%, 60% and 50% of Scenario 2 costs for public health, veterinary services, wildlife monitoring and communication, respectively were used. Under these two scenarios, the total costs to build capacity under the Framework range from approximately US\$8.7 billion to US\$16.2 billion for a 12-year period, or US\$852 million to US\$1.4 billion annually. It should be noted that of this annual sum, between US\$542 and US\$735 will be required annually to continue the HPAI campaign over the next three years, but from the fourth year, this amount will go towards supporting the Strategic Framework more broadly. It should also be noted that, while the costs of controlling disease outbreaks were included in estimates for continuing the HPAI campaign, no attempt was made at doing so for estimates beyond this disease. Consequently, such costs were not included in the Framework and will be left to contingency funding, as discussed below.

Table 5.4: Estimated cost of funding the OWOH Framework to 2020 (US\$ million)

Category of expenditure	Scenario 1 43 low-income countries	Scenario 2 139 eligible countries
Prevention		
- Public health services	1,264	3,083
- Veterinary services	3,286	5,476
- Wildlife monitoring	1,495	2,495
- Communication	583	1,167
- International organizations	3,180	3,475
- Research	420	420
Total	10,228	16,116
Average per year	852	1,343

Regardless of the sources of data used or the robustness of the assumptions on which these calculations are based, the results can only be considered informed estimates—indicative costs that will likely have to be recalculated amidst high uncertainty and in response to rapidly changing circumstances. Moreover, these estimates are not intended to substitute for the extensive and detailed processes of economic, financial and technical appraisal necessary prior to any investments at the country, regional or global level.

8.5 Contingency funding for the unknown Epidemic and pandemic periods

Too little is known about the frequency, nature and extent of new disease outbreaks to attempt to estimate the cost of responding to them. It is expected that funding for such disease outbreaks (beyond HPAI) will be met from contingencies, such as emergency provisions, of the various bilateral and multilateral financing organizations.

The proposed contingency mechanism will use existing facilities to provide contingency funds to countries, where private insurance is not available, in order to respond to outbreaks of previously undefined magnitude and unknown characteristics. The main objective is to provide rapid access to resources for critical needs in case of an outbreak. Countries could prepare detailed contingency plans to be approved by an external expert group. Emergency funds would be processed under accelerated, consolidated and simplified procedures and would be subject to streamline requirements, including fiduciary and safeguard areas. Challenges include agreeing on what events can trigger disbursement and how to independently verify such events, as well as defining criteria to determine coverage and eligibility of a country. Overall, this mechanism should have speed, flexibility and simplicity for an effective rapid response.

8.6 Source of funds

In considering possible financing frameworks and recognizing the sustained involvement of the donor community through a wide range of financial instruments, it is recommended to opt for a coordinating mechanism rather than a single new vertical

fund. The architecture of the Multi-donor Financing Framework¹⁴ adopted in Beijing for AHI could be expanded in the context of OWOH and would focus on the coordination of donor funds and activities to provide support through grants, loans and credits channelled to the countries in various ways. To be comprehensive, the financing framework would include contributions from non-conventional donors, including vertical funds, central emergency response funds and foundations.

Much more work is needed to detail resource mobilization for the framework, but in view of the magnitude of the task and in order to be comprehensive, the financing framework would need to mobilize contributions from a variety of sources, including:

- The conventional donors, which have already contributed to the Multi-donor Financing Framework; their participation in the Fund would directly contribute to achieving the MDGs
- The non-conventional donors and foundations, such as the vertical funds, now focusing on the control of specific diseases; supporting this Framework would enable these organizations to underpin their disease-specific efforts with a solid public health and veterinary infrastructure
- Other emergency funds, such as the Global Fund for Emergencies and Compensation (under consideration)¹⁵, the UN Centre for Emergency Response and the FAO Special Fund for Emergency and Rehabilitation Activities, as the Framework would be directly relevant to their mandates
- The World Animal Health and Welfare Fund of the OIE, in particular for PVS evaluations, gap analysis, PVS follow-up activities and laboratory twinings
- The World Bank and the Regional IFIs
- Industry, including all the components of the food chain, such as large feed, processing and distribution companies, as any epizootic would be a major challenge to their economic viability
- Meat exporting countries, including middle-income countries such as Brazil and Thailand, as their livestock sector would be directly affected by the outbreak of a zoonotic epidemic and/or pandemic.

The introduction of a special system of levies at the international level to fund public health infrastructure in several developing countries, particularly fragile states, would need to be seriously considered.

8.7 Existing initiatives

Since the cornerstone of the Strategic Framework is surveillance, there is a need to improve the coordination of the animal and public health surveillance systems. WHO Member States began implementation of the IHR in 2007. This comprehensive instrument provides a good framework for implementing the current strategy. Animal surveillance follows authoritative standards and prescriptive guidelines defined by OIE and FAO. Alternatively, OIE has developed at a global level an instrument (PVS) to assess the compliance of national veterinary services with democratically adopted standards on good governance. As WHO also has instruments to evaluate surveillance

¹⁴ *Avian and Human Influenza: Multi-donor Financing Framework. World Bank, January 12, 2006*

¹⁵ OIE and World Bank. 'Prevention and control of animal diseases worldwide. Feasibility study – A global fund for emergency response in developing countries'. Presented in Washington, October 2007.

and other services, it would be important to devise ways in which activities can come together and to cross-reference key areas of intersection.

Improving public health surveillance systems and complementary animal health surveillance should be viewed as part of an overall strategic approach to health system strengthening. Where such initiatives are ongoing, particularly where there are agreements among multiple partners (for example IHP plus¹⁶), efforts will be made to coordinate or integrate activities where possible.

The World Bank should identify best practices for results-based financing schemes, share the information with the technical agencies and be able to provide assistance in the financial design of country projects. A coordinating body is probably needed, its main responsibilities being harmonizing the work of various stakeholders with different mandates; it should also have expanded monitoring and evaluation functions.

8.8 Moving forward

Building on the successes and lessons learned from the experience of dealing with the H5N1 HPAI crisis, the goal of the proposed Strategic Framework and implementation options is to diminish the risk and minimize the global impact of epidemics and pandemics due to EID. Enhanced disease intelligence, surveillance and emergency response systems at national, regional and international levels, which are supported by strong and stable public and animal health services and effective communication strategies are the proposed approaches. These efforts contribute significantly to the larger vision of improving public health, food safety and security, improving the livelihoods of poor farming communities and protecting the health of ecosystems. In trying to achieve this goal, the following recommendations are proposed:

1. As efforts to prepare for and respond to the H5N1 HPAI crisis over recent years have demonstrated, a sustained global effort will be key. It is therefore important for the nations of the world to find a means to debate, pursue, finance, implement and track this Strategic Framework.
2. Options for implementing this Strategic Framework start with the principle that responsibility for animal and human health is taken forward at the country level, within the context of national institutions and legal frameworks. However, international attention is needed because of the cross-border nature of many diseases; nations will need to pay extra attention to these realities.
3. The collaborative effort that has been generated by the H5N1 HPAI crisis, in particular through the yearly inter-governmental conferences that have brought together officials from governments, UN agencies, international and regional organizations and IFIs, should continue. In 2009, nations should engage in consultations on optimum ways to implement this Strategic Framework and reduce disease at the animal–human–ecosystems interface.

¹⁶ 'IHP plus' stands for International Health Partnerships and related initiatives which was launched in 2007 to respond to MDG challenges, through scaling up of access to, and quality of, essential health services in low-income countries. The leadership and coordination of this process is carried out by the country, with support from interagency health sector teams.

Annex 1: The Manhattan Principles on ‘One World, One Health’

Health experts from around the world met on September 29, 2004 for a symposium focused on the current and potential movements of diseases among human, domestic animal, and wildlife populations organized by the Wildlife Conservation Society and hosted by The Rockefeller University. Using case studies on Ebola, avian influenza, and chronic wasting disease as examples, the assembled expert panelists delineated priorities for an international, interdisciplinary approach for combating threats to the health of life on Earth. The product—called the ‘Manhattan Principles’ by the organizers of the ‘One World, One Health’ event—lists 12 recommendations (see below) for establishing a more holistic approach to preventing epidemic/epizootic disease and for maintaining ecosystem integrity for the benefit of humans, their domesticated animals, and the foundational biodiversity that supports us all.

Representatives from the World Health Organization; the UN Food and Agriculture Organization; the Centers for Disease Control and Prevention; the United States Geological Survey National Wildlife Health Center; the United States Department of Agriculture; the Canadian Cooperative Wildlife Health Centre; the *Laboratoire Nationale de Santé Publique* of Brazzaville, Republic of Congo; the IUCN Commission on Environmental Law; and the Wildlife Conservation Society were among the many participants.

Recent outbreaks of West Nile virus, Ebola hemorrhagic fever, SARS, Monkeypox, mad cow disease and avian influenza remind us that human and animal health are intimately connected. A broader understanding of health and disease demands a unity of approach achievable only through a convergence of human, domestic animal and wildlife health: ‘One Health’. Phenomena such as species loss, habitat degradation, pollution, invasive alien species, and global climate change are fundamentally altering life on our planet, from terrestrial wilderness and ocean depths to the most densely populated cities. The rise of emerging and resurging infectious diseases threatens not only humans (and their food supplies and economies), but also the fauna and flora comprising the critically needed biodiversity that supports the living infrastructure of our world. The earnestness and effectiveness of humankind's environmental stewardship and our future health have never been more clearly linked. To win the disease battles of the 21st century while ensuring the biological integrity of the Earth for future generations requires interdisciplinary and cross-sectoral approaches to disease prevention, surveillance, monitoring, control and mitigation, as well as to environmental conservation.

We urge the world's leaders, civil society, the global health community and institutions of science to:

1. Recognize the essential link between human, domestic animal and wildlife health and the threat disease poses to people, their food supplies and economies, and the biodiversity essential to maintaining the healthy environments and functioning ecosystems we all require.
2. Recognize that decisions regarding land and water use have real implications for health. Alterations in the resilience of ecosystems and shifts in patterns of disease emergence and spread manifest themselves when we fail to recognize this relationship.
3. Include wildlife health science as an essential component of global disease prevention, surveillance, monitoring, control and mitigation.
4. Recognize that public health programs can greatly contribute to conservation efforts.

5. Devise adaptive, holistic and forward-looking approaches to the prevention, surveillance, monitoring, control and mitigation of emerging and resurging diseases that take the complex interconnections among species into full account.
6. Seek opportunities to fully integrate biodiversity conservation perspectives and human needs (including those related to domestic animal health) when developing solutions to infectious disease threats.
7. Reduce the demand for and better regulate the international live wildlife and bush meat trade not only to protect wildlife populations but also to lessen the risks of disease movement, cross-species transmission, and the development of novel pathogen-host relationships. The costs of this worldwide trade in terms of impacts on public health, agriculture and conservation are enormous, and the global community must address this trade as the real threat it is to global socio-economic security.
8. Restrict the mass culling of free-ranging wildlife species for disease control to situations where there is a multidisciplinary, international scientific consensus that a wildlife population poses an urgent, significant threat to public health, food security, or wildlife health more broadly.
9. Increase investment in the global human and animal health infrastructure commensurate with the serious nature of emerging and resurging disease threats to people, domestic animals and wildlife. Enhanced capacity for global human and animal health surveillance and for clear, timely information-sharing (that takes language barriers into account) can only help improve coordination of responses among governmental and non-governmental agencies, public and animal health institutions, vaccine or pharmaceutical manufacturers, and other stakeholders.
10. Form collaborative relationships among governments, local people, and the private and public (i.e. non-profit) sectors to meet the challenges of global health and biodiversity conservation.
11. Provide adequate resources and support for global wildlife health surveillance networks that exchange disease information with the public health and agricultural animal health communities as part of early warning systems for the emergence and resurgence of disease threats.
12. Invest in educating and raising awareness among the world's people and in influencing the policy process to increase recognition that we must better understand the relationships between health and ecosystem integrity to succeed in improving prospects for a healthier planet.

It is clear that no one discipline or sector of society has enough knowledge and resources to prevent the emergence or resurgence of diseases in today's globalized world. No one nation can reverse the patterns of habitat loss and extinction that can and do undermine the health of people and animals. Only by breaking down the barriers among agencies, individuals, specialties and sectors can we unleash the innovation and expertise needed to meet the many serious challenges to the health of people, domestic animals, and wildlife and to the integrity of ecosystems. Solving today's threats and tomorrow's problems cannot be accomplished with yesterday's approaches. We are in an era of 'One World, One Health' and we must devise adaptive, forward-looking and multidisciplinary solutions to the challenges that undoubtedly lie ahead.

Annex 2: Advantages and challenges to an OWOH approach

If we premise OWOH on the need for cross-sectoral approaches, addressing global linkages and multiple perceptions (from farmers to policy makers, of developing and developed countries) it is important to begin to outline what advantages and challenges there are to such perspectives and approaches on a practical level. Clearly, there needs to be much more done under a OWOH approach, the recognition of which can facilitate and catalyse further advances in the integration of health systems and forward-looking management of risks. Where previously there has been no economic or social driver for change from separate systems, new pressures may motivate institutions to do things differently. However, challenges in existing health systems and lack of experience in OWOH may reduce the efficacy of using the approach.

Advantages

- Reiterating the basic issues above: We are now dealing with intensified, global circulation of pathogens where we recognize that managing risk is not possible in one sector alone. Also, when we are trying to stop the disease at source we aim to prevent disease emergence, spread and persistence, rather than just try to cure the symptoms.
- Cooperation across sectors and between a wider range of stakeholders enhances effectiveness. With more joint work between sectors and disciplines, we can get a better understanding of the epidemiology of diseases (e.g. West Nile and SARS animal health/veterinary side provided key pieces of information), which means we can detect and respond to them earlier. We need those who may be the first to see the disease, and it is important to build cooperation with those on the front line (e.g. farmers, veterinarians and local governments) who are dealing with multiple diseases and public health issues. This increases incentives for collaboration.
- There can be efficiency in the use of resources through better intersectoral coordination, for example dealing with combinations of diseases (e.g. combined vaccines); thus there are some economies of scale. Harmonization can bring coherence of communication approaches, and unifying communication messages. Importantly it can support faster and better coordination in crisis.
- There may be multiple gains from the collective effort by UN agencies (particularly WHO, FAO, United Nations Development Programme [UNDP] and UNICEF) and the OIE to deal with root causes, and help to nurture sense of shared responsibility over future. This may also be important to show how to build on existing and new collaboration among international specialized agencies, where these can be shown to be working effectively together to provide models and encouragement for country-level efforts.

Challenges

- With the inherent complexity and the stage of our understanding of OWOH issues, there are many uncertainties that need to be assessed (both in terms of time and money) and entry points for actions to be determined. It is often difficult to know where to start and how to prioritize actions, many options arise out of analysis of problems, and solutions will tend to be highly context-specific. In fact, there is an enormous challenge in assessing benefit–cost ratios where there are little comparable measures (different economists) for benefits across the health domains.
- The limits and costs of agency interaction cannot be underestimated: cash-strapped bureaucracies have different priorities (typically for the top three animal and human diseases within ministries), and there are frequently inter-ministerial rivalries over budget allocations. There may be simply legal barriers to interaction, or other

structural barriers to cooperation. There may be considerable uncertainties on who should pay for addressing the problems—between sectors, between central and local, private and public, and between countries.

- There are also high transaction costs for collaboration (e.g. for different ministries to come together for discussion and planning). With ecosystem dynamics in the picture, even more actors are involved. There are also opportunity costs—where there are already many joint activities.
- There may also be cultural and perception issues to overcome. Holistic, complex solutions can be difficult to sell politically; they need complex messages, and proposing and making changes within large bureaucratic organizations is often resisted. It often requires cultural shifts within agencies, and new systems and capacities to be built (also with costs), and it may even require changes in attitudinal relationships between professions (veterinarians, doctors, extension workers, biologists and workers in the area of the environment and natural resources).

Annex 3: List of diseases of common interest

Annex to the Specific Agreement of the OIE with FAO and WHO: The Global Early Warning and Response System for Major Animal Diseases, including Zoonoses (GLEWS)¹⁷

Non-zoonotic

- African swine fever (ASF)
- Classical swine fever (CSF)
- Contagious bovine pleuropneumonia (CBPP)
- Foot and mouth disease (FMD)
- *Peste des petits ruminants* (PPR)
- Rinderpest

Zoonotic

- Anthrax
- Bovine spongiform encephalopathy (BSE)
- Brucellosis (*B. melitensis*)
- Crimean Congo haemorrhagic fever
- Ebola virus
- Food-borne diseases
- Highly pathogenic avian influenza (HPAI)
- Japanese encephalitis
- Marburg haemorrhagic fever
- New World screwworm
- Nipah virus
- Old World screwworm
- Q Fever
- Rabies
- Rift Valley fever (RVF)
- Sheep pox/goat pox
- Tularemia
- Venezuelan equine encephalomyelitis
- West Nile virus (WNV)

¹⁷ www.oie.int/eng/oie/accords/glews_tripartite-finalversion010206.pdf

Annex 4: International technical agencies, collaboration and new mechanisms

The Food and Agriculture Organization (www.fao.org) of the United Nations is an intergovernmental organization. It has 192 [member countries](#) plus one member organization, the European Commission. Since its inception, FAO has worked to alleviate poverty and hunger by promoting agricultural development, improved nutrition and the pursuit of food security—defined as the access of all people at all times to the food they need for an active and healthy life. A specific priority of the Organization is encouraging sustainable agriculture and rural development, a long-term strategy for increasing food production and food security while conserving and managing natural resources. Its development goals are consistent with a number of other international and regional agencies.

FAO has strong multidisciplinary programs and a comprehensive knowledge base with respect to animal diseases and related disciplines (including food safety; agricultural and pro-poor livestock policy development; livestock, environment and development; commodity multisectoral investment programs; and management of medium-term plans). FAO hosts the Secretariat of the Codex Alimentarius Commission, which sets international food standards, guidelines and recommendations. The Service also hosts two units that deal respectively with food safety risk assessment (scientific evaluation of food additives, veterinary drugs, chemical and microbiological contaminants, genetically modified foods, etc.) and with the development of methodologies, manuals and guidelines to assist developing countries in their food safety development work.

Under the aegis of FAO Emergency Prevention System for Transboundary Animal and Plant Pests and Diseases (EMPRES), the Global Rinderpest Eradication Program of FAO has achieved the eradication of rinderpest in the whole of Asia and likely Africa. This is a major achievement, as this highly infectious and killer disease has been known to wipe out large populations of cattle and buffalo, destroying livestock industries in its wake and threatening food security and livelihoods of the poor farmers. In response to repeated shocks of infectious livestock diseases, FAO jointly with OIE and in collaboration with WHO, has developed a Global Framework for Progressive Control of Transboundary Animal Diseases (GF-TADs). This framework is now the basis of a global network of project on TADs in collaboration with specialized regional organizations as well as countries. FAO has recently established an Emergency Centre for Transboundary Animal Diseases (ECTAD) within EMPRES to specifically support control of such diseases globally.

Through its joint FAO-IAEA (International Atomic Energy Agency) Division in Vienna, FAO has its own laboratories recognized by both WHO and OIE as a Collaborating Centre, and through the FAO-IAEA Coordinated Research Program FAO supports animal disease control in more than 70 countries, including those in the Greater Mekong Subregion, Southeast Asia and South Asia. FAO has taken the global lead in the establishment of national transboundary animal disease information systems, referred to as TADinfo.

Since the emergence of H5N1 HPAI in Southeast Asia in late 2003 and early 2004, FAO has been the leading organization in tackling the global crisis. FAO was the first international organization to react to this crisis, given the magnitude of the socio-economic disaster and the recognition that most efficient way to prevent a human pandemic was to control the disease at the source, i.e. in poultry. Emergency funds of US\$5.5 million were provided to support country plans to control HPAI and establish regional networks on surveillance, diagnostic and disease information in Asia. National and global strategies were then prepared and inter-agency coordination was promoted. FAO also took the lead in coordinating international support to mobilize substantial financial resources to address the crisis. A significant information and communication material has been produced by FAO, including FAO AIDE

News, a dedicated web site on HPAI and a dedicated issue of the award winning EMPRES bulletin. In collaboration with its main partners, OIE and WHO, FAO has published numerous documents and publications on HPAI, all which can be downloaded from the FAO website. FAO has also been a lead organization in coordinating scientific, review and international pledging conferences on HPAI. Through its vast network of regional and country offices globally, FAO has also been able to deliver a large number of projects in the field to develop early detection and response capacity and has been able to strengthen intersectoral collaboration to include wildlife programmes at country, regional and international levels.

The FAO Global Programme for HPAI Prevention and Control

FAO has developed a Global Programme to document its operational plan for a three-year period (2006–2008). This Global Programme, initially developed in early 2006 and revised in May 2006, is currently being updated to accommodate this revision of the Global Strategy and the realities of a changing situation in the field.

At the global level, FAO coordinates and manages the international effort for an effective HPAI global response in collaboration with OIE. Through ECTAD, it utilizes GLEWS, OFFLU (OIE/FAO Network), global wildlife surveillance and the Crisis Management Centre. A knowledge network linking UN agencies working on social, economic and policy analysis of avian influenza with government agencies and research centres in infected and at-risk countries, international research groups and NGOs, has been established by FAO on behalf of the UN system and will be hosted by FAO for at least a further year.

At the regional level, FAO seeks to provide the regional coordination and harmonization that is vital for controlling transboundary diseases such as HPAI, because infection in one country threatens all countries in a given region. FAO works to build regional strength in veterinary and laboratory infrastructure, epidemiological expertise and disease control. Within the coordinating mechanism of GF-TADs, decentralized ECTAD regional centres and regional animal health centres are being established in various locations around the world.

FAO's input at the national level is based on each country's specific needs and situation. FAO's vital role lies in providing support in preparedness planning to countries at risk of infection, rapid technical assistance, and the necessary operational support to the governments of affected countries. While emergency and short-term assistance is indispensable, FAO is committed to long-term assistance to secure the control and eradication of the disease and better preparedness for future zoonoses and other transboundary diseases.

It has close working relations with WHO, United Nations Environment Programme (UNEP), World Trade Organization (WTO), OIE, World Bank and several CGIAR Centers.

The United Nations Children's Fund (UNICEF) is mandated to advocate for the protection of children's rights, to help meet their basic needs and to expand their opportunities to reach their full potential. Guided by the Convention on the Rights of the Child, UNICEF strives to establish children's rights as international standards of behaviour towards children. UNICEF's role is to mobilize political will and material resources to help countries place children as a top priority. Using a human-rights-based approach to programming, UNICEF is committed to ensuring special protection for the most disadvantaged children and women.

To fulfil its mandate, UNICEF is on the ground in over 150 countries and territories to help children survive and thrive, from early childhood through adolescence. The world's largest provider of vaccines for developing countries, UNICEF supports child health and nutrition, good water and sanitation, quality basic education for all boys and girls, and the protection of children from violence, exploitation and AIDS.

Since 2005, UNICEF has been involved in programmes that address the threat posed by Avian and Pandemic Influenza. UNICEF with partners is primarily supporting governments to ensure communities are mobilized to take adequate preventive actions to minimize the threat of HPAI on families, especially children. In an increasingly complex and inter-

connected world, UNICEF is committed to providing support to address threats as a result of climate change, new and emerging diseases and impact due to rising food prices—all of which affect children the most.

The World Health Organization: WHO (www.who.org) is the United Nation's specialised agency for health with a mission to attain the highest level of health for all peoples, particularly the poor and most vulnerable. Several WHO programmes develop standards and guidelines, coordinate research and provide technical assistance on specific zoonoses, in collaboration with FAO and OIE. The work of the Organization is supported by a network of some 50 WHO Collaborating Centres, most of which shared with FAO and OIE. A key focus of WHO is food safety. WHO, in collaboration with FAO, administers the Codex Alimentarius, the international food code by which food quality is measured. The WHO has also established global influenza programme, the oldest disease control programme at WHO with a major task to provide global influenza surveillance. The programme has a network of laboratories commissioned to study circulating influenza viruses, collected from around the world, and document changes in the viruses' genetic make-up. Today, the WHO Global Influenza Surveillance Network consists of 113 national influenza centres located in 84 countries, and four WHO collaborating centres for influenza reference and research, located in London (England), Atlanta (USA), Melbourne (Australia), and Tokyo (Japan). A fifth collaborating centre, located in Memphis, USA, performs specialized work on influenza viruses in animals. The WHO network has thus contributed greatly to the understanding of influenza epidemiology and assists manufacturers both by ensuring that influenza vaccines contain the most appropriate viruses and by providing them with high-yielding 'seed' virus for vaccine production. The results are reported directly to WHO. The four collaborating centres also store virus samples for historical comparisons and provide diagnostic support for countries experiencing unusual influenza cases, such as those caused by H5N1. In responding to the H5N1 outbreaks, WHO has also drawn considerable support from a second network of laboratories and scientists conducting work on animal influenza. WHO is also an important partner in the GF-TADs initiative and will share and pool resources to develop common disease information system with FAO and OIE to keep the international community constantly alert to the threat of outbreaks of infectious diseases. WHO's alert and response operation collects and analyses information on disease outbreaks and other events that pose risks to public health 24 hours a day, 7 days a week. This information is gathered from both official reports submitted by Member States and informal sources, such as news wires and other media. The information undergoes a process of risk assessment involving experts within the Organization including epidemiologists, disease-specific experts, entomologists and veterinarians. WHO then verifies the accuracy of the information, using its extended network of 147 Country Offices and six Regional Offices. Information is shared in accordance with WHO policy and the IHR. WHO offers assistance to affected countries in the form of technical advice, supplies and, in some cases, by coordinating an international response. These operational responses draw technical resources from within the WHO system and from the Global Outbreak Alert and Response Network (GOARN). GOARN is a technical collaboration of 110 technical institutions, NGOs and networks. It represents a pooled resource for alert and response operations. WHO coordinates the work of the Mediterranean Zoonoses Control Programme (MZCP), in collaboration with FAO and OIE. The Pan American Health Organization, the WHO Regional Office for the Americas (PAHO) has a VPH programme. The PAHO/VPH programme is coordinated by the PANAFTOSA, Brazil and, in addition to zoonoses, it addresses food safety and FMD.

The World Organization for Animal Health (OIE) (www.oie.int) is an intergovernmental organization with 172 Member Countries and Territories¹⁸ as of 2007, and is responsible for improving animal health worldwide. It was created by the International Agreement of 25 January 1924. It is also recognized as a reference organization by the WTO. The OIE

¹⁸ http://www.oie.int/eng/OIE/PM/en_PM.htm?e1d1

maintains permanent relations with 35 other international and regional organizations and has regional and subregional offices on every continent. OIE's priority missions are:

(i) Transparency of the animal disease situation worldwide

Each Member Country and Territory has a commitment to inform the OIE of occurrences of animal diseases, including those transmissible to humans. The OIE then disseminates the information to all other countries so they can take the necessary steps to protect themselves.

(ii) Scientific excellence

Through its first-rate worldwide scientific network of about 200 Collaborating Centres and Reference Laboratories, the OIE collects, analyses and publishes the latest scientific information on control methods for animal diseases, including those transmissible to humans.

(iii) International support to developing countries and the role played by veterinary services

The OIE's core objective is to improve animal health throughout the world. This mandate benefits all Member Countries and Territories. The OIE endeavours to persuade developed countries and financial institutions to support poor countries and their veterinary services. The OIE sees veterinary services as a global public good and their compliance with international standards as a priority for public investment.

(iv) Safety of international trade of animals and animal products

The OIE develops standards for use by its Members to protect themselves from incursions of diseases or pathogens while avoiding unjustified sanitary barriers. OIE standards are recognized as the international reference under the terms of the SPS Agreement.

(v) Food safety

The Member Countries and Territories of the OIE and of the Codex Alimentarius Commission coordinate activities to ensure improved safety of food of animal origin. The OIE's standard-setting activities in this field focus on eliminating hazards existing during production at the farm and prior to the slaughter of animals or the primary processing of animal products (meat, milk, eggs, etc.) that could pose a risk to consumers.

(v) Animal welfare

The OIE is internationally recognized as the sole intergovernmental reference organization for animal health and welfare and for the publication of standards and guidelines in this field.

OIE programmes

Evaluation of Performances of Veterinary Services

The OIE's 172 member countries and territories have democratically adopted quality standards and guidelines for the evaluation of veterinary services. These are international standards for surveillance, prevention, control and eradication of animal diseases, as well as for safe trade in animals and animal products. The guidelines for the evaluation of veterinary services help countries—in particular developing countries and countries in transition—to justify contributions requested from national governments and international donors for their capacity building and the strengthening of their veterinary services.

Capacity building of national veterinary services is a key factor for creating and reinforcing effective legal frameworks, including early detection networks, rapid notification of suspected cases of diseases, quick and reliable diagnosis, rapid response to outbreaks, national chains of command and public-private partnerships (animal owners organizations and private veterinarians). This allows for rapid response in controlling and containing emerging and re-emerging diseases in the early stages of outbreaks.

For this purpose, the OIE has developed the OIE-PVS Tool for the Evaluation of Performances of Veterinary Services (formerly 'Performance, Vision and Strategy' [PVS] instrument), a useful tool to assess veterinary services in accordance with the OIE standards

and guidelines regarding the evaluation of veterinary services (as per Chapters 1.3.3. and 1.3.4 of the OIE *Terrestrial Animal Health Code*).

The PVS instrument is not only an assessment tool, but also a development tool that permits collaboration with veterinary services to identify gaps and deficiencies, facilitate the elaboration of national investment programmes and their follow-up over time, and thus provide a framework and justification for leveraging funds from national budgets and, if necessary, international donors, including the World Bank and developed countries, which have pledged funds to assist developing countries and countries in transition in strengthening their veterinary services. These identified gaps and deficiencies will also provide detailed references for governments to develop policies directed at investments and improvement of veterinary service capacities.

Laboratory support, including OFFLU and twinning programmes

Two of the OIE's main objectives are to collect, analyse and disseminate scientific veterinary information and to provide and encourage international solidarity in the control of animal diseases.

The OIE/FAO OFFLU network will be further strengthened, in particular for the collection of animal virus strains and increased transparency.

In January 2005, the OIE Biological Standards Commission expressed its wish "to assist laboratories in developing countries to build their capacity with the eventual aim that some of them could become OIE Reference Laboratories in their own right". The Commission drafted a first template to guide laboratories wishing to make twinning arrangements. The laboratory twinning aims to encourage the transfer technical expertise between OIE reference laboratories and possible/potential new reference laboratories. It involves the exchange of experts between such laboratories and facilitation of the work of medium-term (several months) resident laboratory experts in developing countries and vice versa. FAO will be involved in this programme.

Capacity building at regional and national level

In all regions, the OIE develops capacity building programmes for national policy-makers and stakeholders from the private sector in order to improve governance on animal health systems worldwide. Priority is given to regional seminars but some are national (e.g. to build alliances between the public and private sectors). In order to avoid overlaps or gaps, GF-TADs regional steering committees are consulted for regional programme coordination.

Annex 5: Indicative research topics

1. Drivers and sources of disease emergence

- Research is needed to better understand the interactions between host, pathogen and environment that contribute to inter-species jumps and adaptation in a new host.
- There is a need to identify microbial populations in different farming systems, mechanisms of evolution to a changing environment, and changes in molecular characteristics that signal emergence.
- There is a need to identify major wild animals that are risk factors for humans.
- Isolation and molecular characterization of pathogens carried by these wild animals need to be conducted and their genomic sequences compared with the known database of pathogens.
- A global effort is also needed to develop more generic tools to rapidly characterize pathogens in the three health domains.

2. Factors for spread

- Information on infection and transmission dynamics of the existing pathogens that re-emerge on a regular basis is crucial to better target and predict how diseases will re-emerge and behave.
- Specific epidemiological studies need to be set up opportunistically during outbreaks of emerging diseases to generate more precise information on the infection and transmission behaviour of pathogens under different farming systems and human populations, as well as remote sensing techniques, which can contribute to pathogen emergence (precipitation, wind direction, etc.).
- Factors that stimulate or provoke shedding of pathogens from carrier wild animals may be important in identifying risk factors.
- The legal and illegal trade in domestic and wild animals needs to be monitored for pathogens. Targeted surveillance in these animals may provide important information about pathogen movements.

3. Factors for persistence

- The interaction between various hosts (humans and animals) and pathogens in different environments needs to be better understood to identify the causes of persistence.
- There are also epidemiological situations where pathogens continue to persist in certain systems. For example, HPAI appears to have become entrenched in the predominantly smallholder poultry sector in some countries. It is believed that poor farming conditions create a conducive environment for pathogens to thrive. Such systems are a constant source of infections, creating hotspots for emergence and re-emergence of infectious diseases. Field studies are needed in poor communities to better understand the persistence dynamics of pathogens.

4. Biology of pathogens in different systems

- Pathogen environments are constantly changing due to rapid evolution of farming systems. Understanding what populations of potential pathogens exist in these systems and how they change with their environment provides basic information of the pathogens. This information may be of significance in the context of evaluating potential for emergence of new diseases and also for the development of rapid diagnostic tools and vaccines (see below).

5. Development of new tools for diagnosis and prevention

- Better diagnostic tools and vaccines are required for existing and emerging infectious diseases. The development of these tools can be supported by a basic molecular understanding of the pathogens.

6. Socio-economic/cultural studies

- Understanding the conditions, motives and priorities of farmers and stakeholders is critical to developing appropriate and interventions to enable sustainable change, especially to engage community participation in disease control.

7. Institutional complexities and variability

- The OWOH approach necessitates cross-sectoral collaboration with the involvement of multiple stakeholders. A survey to identify a range of partners that could be involved at various levels is necessary, and possible constraints to partnerships need to be identified. These studies might also help to identify synergies and areas of overlap among institutes and provide justification for collaboration.

Annex 6: Basic assumptions used to assess the Strategic Framework's financing requirements

This annex describes the assumptions used to calculate the different components of the financial gaps and needs provided in Chapter 8. As previously indicated, the figures contained herein are preliminary, and should be viewed as indicative only. The individual countries located in the regions of Table A6.1 were identified and data collected on these countries. In summary, the cost estimate is based on individual countries as the basic unit, according to human and livestock population and land area for wild-life, adjusted for the country's income level, with a breakdown for low-income (LI), low middle-income (LMI), upper middle-income (UMI) and high-income countries (HI). The livestock population was aggregated on the basis of Average Livestock Units (ALU)¹⁹ per species (source: FAO STAT). Not included were high-income-non-IBRD countries²⁰. Table A6.1 provides the details on a regional basis.

Table A6.1. Background data for included countries

Region*	# Countries				Total	Human population in million	#t ALU in million**	Area of land in million km2
	LI	LMI	UMI	HI				
AFR	34	8	0	0	42	806	167	24
EAP	5	13	3	0	21	1931	335	103
ECA	3	9	11	1	24	466	100	24
LCR	1	11	16	4	32	555	178	20
MNA	1	9	2	0	12	310	44	9
SAR	4	4	0	0	8	1567	231	12
Total	48	54	32	5	139	5635	1055	192

*AFR: Africa Region; EAP: East Asia and Pacific Region; ECA: East Europe and Central Asia Region; LCR: Latin America and Caribbean Region; MNA: Middle East and North Africa Region; SAR: South Asia Region

**ALU Average Livestock Unit.

The estimated **unit costs** for the Strategic Framework were based on the cost figures provided in the paper prepared for the Bamako HPAI conference. Following this paper the costs were divided into cost for infrastructure development and costs for maintaining the infrastructure, and split out for:

- Public health Services (in US\$ per 1000 people)
- Communication (in US\$ per 1000 people)
- Veterinary services (in US\$ per ALU).

These unit costs were **adjusted** for:

- The economies of scale in surveillance and early response costs, if other species are to be covered in addition to poultry. The calculated costs per ALU were therefore converted with 0.7 for the second species and 0.15 for the third species to be covered. No additional costs were assumed if more than three species were included.

¹⁹ Average livestock units. Data refers to the number of animals of the species present in the country at the time of enumeration in terms of livestock unit (LU). It includes animals raised either for draft purposes, for meat and dairy production or for breeding. Live animals in captivity for fur or skin such as foxes and minks are not included. The enumeration chosen, when more than one survey is taken, is the closest to the beginning of the calendar year. Live animals data is reported in livestock unit (LU) for comparison of different species across geographical regions. The conversion factors used to calculate ALU for number of animals are: cattle 0.9, sheep and goats 0.1, pigs 0.2 chicken 0.01 and ducks and geese 0.03. (Source: http://www.fao.org/es/ess/os/envi_indi/annex2.asp)

²⁰ Except Estonia, Hungary and Slovak Republic in ECA and Antigua and Barbuda and Trinidad and Tobago in LAC.

- The *infrastructure funded from previous investments* according to Table A6.2.

Table A6.2. Percentage of total costs already covered by previous investments

Region	Veterinary services	Public health and communication	Wildlife monitoring
AFR	0%	0%	0%
EAP	50%	50%	0%
ECA	75%	75%	0%
LCR	75%	75%	0%
MNA	75%	75%	0%
SAR	50%	50%	0%

This led to the unit costs for human and livestock services, as shown in Table A6.3.

Table A6.3. Unit costs used in the calculations for the investment needs for different income level countries.

Income level	Public health services/1000 humans	Communication/ 1000 humans	Veterinary services/ALU			
			1st species	2nd species	3rd species	4th species
Building infrastructure						
LI	437.616	111.491	10.728	7.663	1.533	0.000
LMI	466.790	118.923	11.443	8.173	1.635	0.000
UMI	525.139	133.789	12.873	9.195	1.839	0.000
HI:	525.139	133.789	12.873	9.195	1.839	0.000
Maintenance						
			1st species	2nd species	3rd species	4th species
LI	466.723	57.594	1.746	1.247	0.249	0.000
LMI	466.790	61.434	1.862	1.330	0.266	0.000
UMI	525.139	69.113	2.095	1.496	0.299	0.000
HI:	466.790	61.434	1.862	1.330	0.266	0.000

To these unit costs per country for human and livestock disease surveillance systems, **the cost of wildlife disease monitoring** still has to be added. However, no reliable unit costs data of such monitoring programs were available, and a more indirect method, which was based on the assumption that countries with a relatively low livestock density need a relative larger fraction of their total funds for wildlife monitoring, was used. Based on this rationale, the share of the total veterinary service cost for monitoring zoonotic diseases in wildlife varied in the calculation of the funding needs according to livestock density (four groups) and monitoring intensity (three levels), as shown in Table A6.4.

Table A6.4. Percentages of the total animal monitoring costs related to wildlife monitoring* for three different monitoring strategies and four different livestock intensities

Group	Maximum ALU/km ² **	Monitoring intensity		
		Intensive	medium	Extensive
1	1.2	80%	50%	20%
2	6.3	60%	30%	10%
3	11.6	40%	20%	5%
4	39.5	20%	10%	5%

*Livestock + wildlife = 100%; ** ALU/ km² average live stock units per square kilometre of counties area.

To the surveillance (including communication) costs of emerging diseases, **the cost for eradication HPAI** still had to be added. The main cost elements are:

- Compensation costs, estimated at US\$2 per chicken
- Culling and destruction and disinfection, assumed at US\$1 per bird
- Vaccination costs, at US\$0.38 per bird, similar to the costs of the last vaccination campaign in Viet Nam (of which vaccine cost is US\$0.18)²¹.

The **number of new outbreaks** during 2007 and up to July 2008 of HPAI in low- and medium-income countries not endemically infected²² was defined, and it is assumed that the frequency and location of new outbreaks would be similar to those in the past year and a half. To calculate the costs for the 10-year period, it is assumed that the HPAI outbreaks continue for another three years before the disease is controlled. Finally, the Strategic Framework should also be able to address **outbreaks of previously unknown diseases**, for which it is assumed that during an outbreak, 1 million ALUs would have to be culled every two years, as shown by historical data. With a farm gate price of US\$234²³ per ALU, this would result in a total funding need of US\$234 million per outbreak.

Finally, a special assessment was made **for the funding needs of the 43 low-income countries**, in line with the recommendations of Chapter 8, which would make the costs of surveillance and eradication of HPAI a global public good and therefore the responsibility of the global community. They are provided in Table A6.5.

Table A6.5. Cost the framework over 10 years in million US\$; Investments in infrastructure restricted to low-income countries (43 countries)

Investment needs for building and maintenance of the infrastructure	
• Public health services	847
• Veterinary services	1,642
• Wildlife monitoring	2,268
• Communication	214
Subtotal	4,971
Central organizations	3,541
Compensation and culling costs (1% animals culled in region)	1,229
Vaccination	6,650
Subtotal	11,420
Total costs in 10-year period	16,391

¹ Standardized to the price level of 2008; no correction for inflation.

²¹ For Africa, due to distribution of poultry units and backyard flocks, the costs were estimated at US\$0.90 (of which vaccine cost is US\$0.18).

²² Based on number of outbreaks from 2007 until July 2008 in low- and medium-income countries (source www.OIE.int)

²³ Average from value of African and Asian ALU (source: FAOSTAT, 2005)

Annex 7: References

1. ALive (2007). *Guidelines for a Comprehensive Approach for the Rapid Assessment of Avian and Human Influenza in Sub-Saharan Africa*. Available at: <http://www.alive-online.org/data/files/alive-ra-guidelines-final.pdf>
2. American Veterinary Medical Association (2008). 'One Health: A New Professional Imperative. Final Report of the One Health Initiative Task Force'. Available at: <http://www.avma.org/onehealth>.
3. Delgado, C.L., Rosegrant, M.W. and Meijer, S. (2001). 'Livestock to 2020: The revolution continues'. Paper presented at the annual meetings of the International Agriculture Trade Research Institute (IATRC). Auckland, New Zealand. International Food Policy Research Institute (IFPRI): Washington, DC. 38 pp.
4. Delgado, C., Rosegrant, M., Steinfeld, H., Ehui, S., and Courbois, C. (1999). *Livestock to 2020: The next food revolution. Food, Agriculture, and the Environment. Discussion Paper 228*. IFPRI, FAO, and the International Livestock Research Institute (ILRI): Washington, DC. 72 pp.
5. FAO (2008). *FAO Report Exercise on Highly Pathogenic Avian Influenza*.
6. FAO and OIE, in collaboration with WHO. 'The Global Strategy for Prevention and Control of H5N1 Highly Pathogenic Avian Influenza' (revised October 2008). Available at: <http://www.fao.org/docrep/010/a1145e/a1145e00.htm>.
7. International Task Force on Global Public Goods (2006). 'Meeting Global Challenges: International Cooperation in the National Interest'. Available at: <http://www.gpgtaskforce.org/bazment.aspx>
8. Jones, K.E., Patel, N.G., Levy, M.A., Storeygard, A., Balk, D., Gittleman, J.L. and Daszak, P. (2008). Global trends in emerging infectious diseases. *Nature* 451: 990–993.
9. OIE and FAO (2007) 'Ensuring good governance to address emerging and re-emerging animal disease threats – supporting the veterinary services of developing countries to meet OIE international standards on quality' (revised September 2007). Available at: http://www.oie.int/downld/Good_Governance07/Good_vet_governance.pdf
10. WHO (2005). 'International Health Regulations (2005). Second Edition'. WHO: Geneva, Switzerland. 74 pp.
11. Wildlife Conservation Society (2004). 'Conference Summary. One World One Health: Building Interdisciplinary Bridges to Health and Globalized World.' The Rockefeller University: New York, NY.
12. World Bank (2006). 'Avian and Human Influenza: Multi-donor Financing Framework.' Available at: www.worldbank.org/avianflu.
13. World Bank/OIE (2008). 'Prevention and control of animal diseases worldwide'. Economic studies. Available at: http://www.oie.int/eng/OIE-WB_Conference_1007/en_Global_Animal_Health_Initiative.htm
 - i. 'Economic analysis – Prevention versus outbreak costs – Final Report – Part I', prepared by Agra CEAS Consulting.
 - ii. 'Feasibility study – A global fund for emergency response in developing countries – Final Report – Part II', prepared by Civic Consulting.
 - iii. 'Pre-feasibility study – Supporting insurance of disease losses – Final Report – Part III', prepared by Civic Consulting.

Annex 8: Web links

www.abcrc.org.au
www.afro.who.int
www.alive-online.org
www.aseansec.org
www.au-ibar.org
www.cdc.gov
www.cgiar.org
www.cms.iucn.org
www.ec.europa.eu/food/animal/diseases/adns/index_en.htm
www.eppo.org/WORLDWIDE/RPPOs/oirsa.htm
www.fao.org
www.galvmed.org
www.mzcp.org
www.offlu.net
www.oie.int
www.ssafe.org
www.saarc-sec.org/main.php
www.un.org/millenniumgoals
www.undg.org/index.cfm?P=21
www.undp.org
www.unep.org
www.unicef.org
www.usaid.gov
www.wcs.org
www.who.int
www.worldbank.org
www.wto.org
www.wwf.org